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NATIONAL GEOGRAPHIC

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Sockeye salmon shoot up the rapids and flip in midair. I see their mirror-bright sides catch and scatter the sun. Propelled by instinct, they return to their birthplace to spawn. Commercial fishermen caught 90 percent of these fish's mates even before the salmon began their odyssey up British Columbia's Fraser River. The ones left have beaten the odds so far. But their journey isn't over, as I found out many years ago on an early assignment for the *Geographic*. I watch as 13-year-old Gordon Alec (above), of the Lillooet tribe, dips his net in the rapids and pirouettes to his left with a captured fish. The ritual of netting salmon is Gordon's ancestral legacy. Drying racks line the Fraser's banks. Young and old camp out under the summer sky and celebrate the catch. But regret is expressed too, as elders recount how diminished the run has become in their lifetime.

This month, writer David Quammen and photographer Randy Olson take us to Russia's Kamchatka Peninsula. Salmon runs are still huge and healthy there. It's a rugged landscape, where at least 20 percent of all Pacific wild salmon go to spawn. "Salmon heaven," Quammen calls it. But this salmon heaven is threatened. It's the same story many fisheries face. The direction this narrative takes—whether someday Kamchatka's salmon runs will be spoken of with regret—will be determined by management decisions made in the next few decades. "At present," says Quammen, "the situation is fluid."

Inspiring people to care about the planet

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April 2009

Australia's Dry Run

It is really buckling to hear about the situation of these broken Australian farmers wishing for a freak monsoon. It is outrageous also that the Australian officials are drying up their livelihoods and not really giving a hooting care. The planet we live on is precious. Humans have been too greedy for too long. The world is winking at us to change our ways. We cannot just go on patching it up willy-nilly.

BEN VAN HEYGEN
Cambridge, England

As an Australian, I enjoyed your article. However, to refer to Australia's drought as the most severe in "the country's 117 years of recorded history" does a disservice to the indigenous inhabitants of Australia. Their "recorded history" might not be ours, but their extraordinarily detailed oral history and traditions of personalizing the environment point to a history that is deeper and more complex than anything we can offer.

GEOFFREY D. BATROUNEY
New Rochelle, New York

Your story left me with the feeling it was written with only

an American audience in mind. It was full of words foreign to the Australian language. No one in Australia has a "ranch," they have "properties" or "stations." No one drives "pickup trucks," they drive "utes." They live in "homesteads," not "farmhouses," that are in the middle of "paddocks," not "meadows" or "fields." Mick Punturiero's fellow farmers would have a hard time saving "dimes" as we don't have any. It was a great article, but it should have been edited by an Australian.

KARYN ALEXANDER
Dubbo, New South Wales

Ice Paradise

I was a bit disappointed that the article and accompanying pictures left out one hardy animal: the 2,500 human beings on Svalbard. How do they live and survive in such a hostile (to humans) environment, particularly during the winter darkness?

FRED KAISER
Silver Spring, Maryland

The article by Bruce Barcott captured the essence of Svalbard beautifully. My only regret is that he did not mention a factor that will probably add even more problems. As the ice recedes and opens up sea routes, some of the world's most powerful governments and big businesses are clamoring over the rights to access the area's oil and mineral reserves. Regardless of the fact that much of Svalbard lies within national parks or nature reserves, the very real threat of heavy industry gaining a foothold under all manner of pretexts is a real danger. Whatever reassurances are given,

do we really want to risk more Exxon Valdez disasters and the associated catastrophic legacy?

FRIEDY LUTHER
Spofforth, England

The King Herself

I am a psychotherapist in private practice and specialize in working with transgender clients. I have done so for over two decades and have seen hundreds of people. Your story unfolds with all the little clues that reveal a tale of gender transition. Suppose for a moment that Hatshepsut was transgender. That would also easily explain the success of her rule. Emerging science is leading to the knowledge that brains of transsexual people look much more like their desired gender than their birth sex and that there is some complex set of factors that bring about this change prior to the birth of the child. This simply means that though her body was female, her brain was more male, and thus some of the more "male-attributed" things related to ruling a kingdom were more available to her. Since we will never truly know who Hatshepsut really was, why can't this explanation be among her/his possibilities? Food for thought, I hope.

MOONHAWK RIVER STONE
Niskayuna, New York

Corrections, Clarifications

April 2009: Soul of Russia
Page 114: The correct name of the priest performing the baptism is Father Alexander.

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LETTERS

The article on Hatshepsut's mummy, however focused on her strengths as a ruler, also made several mentions that she was fat. Maybe that is why she portrayed herself as a man—she was trying to encourage her subjects to look beyond her physicality and judge her for her accomplishments.

LISA WEBB
Green Brook, New Jersey

Vanishing Amphibians

We own a home in the mountains of central Pennsylvania. It has ponds, a small stream with native trout, and numerous seeps. Too rocky for farmland, it is mostly forested. Every year the spring peeper tree frogs would be so loud at times we closed the windows to sleep. Soon any standing water would bubble with tadpoles if approached. But one day about four years ago, I noticed a few dead tadpoles along the water's edge. Over the next week or so, it seemed as if every tadpole had died. The water was littered with corpses. No more ripples when we went to explore. And all were at the same stage of life, when the back legs emerged. How strange! Later I heard of an insidious fungus that was killing frogs the world over. Your article shed a lot of light on the devastation that chytrid brings. These nights I lie awake not to the sound of hundreds of peepers, but straining to hear the call of the few survivors. I only trust 300 million years of evolution have selected some resistance and their offspring will soon lull me to sleep again.

DAN W. JOHNSON
Ashville, Pennsylvania

Geography: What's in an American Name?

The U.S. map framed by American Indian place-names reflects much research and calls our attention to the fact that the area of North America we now call the United States had been settled for thousands of years by American Indian tribal peoples. I'm dismayed that after this research you

My stubborn neighbors wouldn't get rid of the chickens until the health department stepped in, placed rat poison all over the yards, and then made them tear down their chicken coop.

would state, "The first settlers, who put many European words on the map, also borrowed names from local tribes." Europeans were not the first settlers of North (and South) America. Indian tribal peoples had "settled" this land for thousands of years prior to European "discovery."

MARK WEADICK
Coeur d'Alene, Idaho

Culture: Urban Chickens

I live in the borough of Queens, part of New York City. A few years back my neighbors (who come from Europe) decided to put up a chicken coop and raise chickens in their backyard, right next to mine. As soon as

this coop went up, along with the unbearable smell came the rats. They were taking over my yard so that I could no longer let my children or dog out to play. I set up traps and got rid of many of the rats, but I could no longer control the situation. My stubborn neighbors wouldn't get rid of the chickens until the health department stepped in, placed rat poison all over the yards, and then made them tear down their chicken coop. Having chickens in an urban environment is not to be taken lightly.

A. FALCO
Queens, New York

Photo Journal: Only Women

Scenarios similar to that described at San Pablo Huixtepec, Mexico, were enacted countless times in South Africa only a few years ago. "Independent" homelands—so-called Bantustans—were created, and only men were allowed to work as contract laborers for meager wages in the mines and agricultural industries of white South Africa. Only men were given passes to enter white areas, and their wives, children, and the elderly had to remain in their impoverished homelands. I read that in Mexico the system is called *pura mujer*; in South Africa it was grand apartheid. Perhaps under President Obama, the United States will realize that as its economy and Mexico's appear to be so intertwined, immigration laws that cause such inhumane circumstances must be addressed if America still wishes to be regarded as the leader of the free world.

PHILIP VAN DER SPUIJ
Simon's Town, South Africa



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Believe It or Not A joyful dog defying gravity, a bird snagging prey—some things have to be seen to be believed. Have you taken an incredible picture? If so, send it our way; your shot might be published in *National Geographic*. Every month this page features two photographs: one chosen by our editors, one chosen by our readers via our online voting machine. For guidelines, ■ submission form, and more information go to ngm.com/yourshot.



EDITORS' CHOICE

Jason Neely ■ Middletown, Connecticut

"This picture really captures Sidney's personality," says librarian Neely, 34, of his Labrador mix, who leaped through his living room at the first whiff of food. "He's always brimming with enthusiasm and a love for life, as well as treats."

Andy Nguyen ■ Midway City, California

At ■ Long Beach, California, park, Nguyen, a 42-year-old professional photographer, got ■ vivid look at one great egret's unorthodox trout-fishing technique.

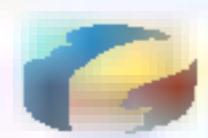


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AMBIEN CR is indicated to help you fall asleep and/or stay asleep.

AMBIEN is indicated for short-term treatment to help you fall asleep.

AMBIEN and AMBIEN CR are treatment options you and your doctor can consider along with lifestyle changes. When taking either of them, don't drive or operate machinery. Plan to devote 7 to 8 hours to sleep before being active. Sleepwalking, and eating or driving while not fully awake, with memory loss for the event, as well as abnormal behaviors such as being more outgoing or aggressive than normal, confusion, agitation, and hallucinations may occur. Don't take it with alcohol as it may increase these

behaviors. In patients with depression, worsening of depression, including risk of suicide may occur. If you experience any of these behaviors contact your doctor immediately.

Allergic reactions such as shortness of breath, swelling of your tongue or throat, may occur and in rare cases may be fatal. If you have an allergic reaction while using AMBIEN or AMBIEN CR, contact your doctor immediately. Side effects of AMBIEN CR may include next-day drowsiness, dizziness and headache. There is a low occurrence of side effects associated with the short-term use of AMBIEN. The most commonly observed side effects in controlled clinical trials were drowsiness, dizziness, and diarrhea.

AMBIEN is taken for 7 to 10 days—or longer as advised by your provider. AMBIEN CR can be taken as long as your doctor recommends. AMBIEN and AMBIEN CR have some risk of dependency. They are non-narcotic.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

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MEDICATION GUIDE

AMBIEN CR® (ām'bē-ən see ahr) **C-IV** (*zolpidem tartrate extended-release tablets*)

Read the Medication Guide that comes with AMBIEN CR before you start taking it and each time you get a refill. There may be new information. This Medication Guide does not take the place of talking to your doctor about your medical condition or treatment.

What is the most important information I should know about AMBIEN CR?

After taking AMBIEN CR, you may get up out of bed while not being fully awake and do an activity that you do not know you are doing. The next morning, you may not remember that you did anything during the night. You have a higher chance for doing these activities if you drink alcohol or take other medicines that make you sleepy with AMBIEN CR. Reported activities include:

- driving a car (“sleep-driving”)
- making and eating food
- talking on the phone
- having sex
- sleep-walking

Call your doctor right away if you find out that you have done any of the above activities after taking AMBIEN CR.

Important:

1. Take AMBIEN CR exactly as prescribed

- Do not take more AMBIEN CR than prescribed.
- Take AMBIEN CR right before you get in bed, not sooner.

2. Do not take AMBIEN CR if you:

- drink alcohol
- take other medicines that can make you sleepy. Talk to your doctor about all of your medicines. Your doctor will tell you if you can take AMBIEN CR with your other medicines.
- cannot get a full night’s sleep

What is AMBIEN CR?

AMBIEN CR is a sedative-hypnotic (sleep) medicine. AMBIEN CR is used in adults for the treatment of a sleep problem called insomnia. Symptoms of insomnia include:

- trouble falling asleep
- waking up often during the night

AMBIEN CR is not for children.

AMBIEN CR is a federally controlled substance (C-IV) because it can be abused or lead to dependence. Keep AMBIEN CR in a safe place to prevent misuse and abuse. Selling or giving away AMBIEN CR may harm others, and is against the law. Tell your doctor if you have ever abused or have been dependent on alcohol, prescription medicines or street drugs.

Who should not take AMBIEN CR?

Do not take AMBIEN CR if you are allergic to anything in it. See the end of this Medication Guide for a complete list of ingredients in AMBIEN CR.

AMBIEN CR may not be right for you. Before starting AMBIEN CR, tell your doctor about all of your health conditions, including if you:

- have a history of depression, mental illness, or suicidal thoughts
- have a history of drug or alcohol abuse or addiction
- have kidney or liver disease
- have a lung disease or breathing problems
- are pregnant, planning to become pregnant, or breastfeeding

Tell your doctor about all of the medicines you take including prescription and nonprescription medicines, vitamins and herbal supplements. Medicines can interact with each other, sometimes causing serious side effects. **Do not take AMBIEN CR with other medicines that can make you sleepy.**

Know the medicines you take. Keep a list of your medicines with you to show your doctor and pharmacist each time you get a new medicine.

How should I take AMBIEN CR?

- Take AMBIEN CR exactly as prescribed. Do not take more AMBIEN CR than prescribed for you.
- **Take AMBIEN CR right before you get into bed.**
- **Do not take AMBIEN CR unless you are able to stay in bed a full night (7-8 hours) before you must be active again.**
- Swallow AMBIEN CR Tablets whole. Do not chew or break the tablets. Tell your doctor if you cannot swallow tablets whole.
- For faster sleep onset, AMBIEN CR should NOT be taken with or immediately after a meal.
- Call your doctor if your insomnia worsens or is not better within 7 to 10 days. This may mean that there is another condition causing your sleep problems.
- If you take too much AMBIEN CR or overdose, call your doctor or poison control center right away, or get emergency treatment.

What are the possible side effects of AMBIEN CR?

Serious side effects of AMBIEN CR include:

- **getting out of bed while not being fully awake and do an activity that you do not know you are doing.** (See “What is the most important information I should know about AMBIEN CR?”)
- **abnormal thoughts and behavior.** Symptoms include more outgoing or aggressive behavior than normal, confusion, agitation, hallucinations, worsening of depression, and suicidal thoughts or actions.
- **memory loss**
- **anxiety**
- **severe allergic reactions.** Symptoms include swelling of the tongue or throat, trouble breathing, and nausea and vomiting. Get emergency medical help if you get these symptoms after taking AMBIEN CR.

Call your doctor right away if you have any of the above side effects or any other side effects that worry you while using AMBIEN CR.

The most common side effects of AMBIEN CR are:

- headache
- sleepiness
- dizziness
- You may still feel drowsy the next day after taking AMBIEN CR. **Do not drive or do other dangerous activities after taking AMBIEN CR until you feel fully awake.**

After you stop taking a sleep medicine, you may have symptoms for 1 to 2 days such as: trouble sleeping, nausea, flushing, lightheadedness, uncontrolled crying, vomiting, stomach cramps, panic attack, nervousness, and stomach area pain. These are not all the side effects of AMBIEN CR. Ask your doctor or pharmacist for more information.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

How should I store AMBIEN CR?

- Store AMBIEN CR at room temperature, 59° to 77°F (15° to 25° C).
- **Keep AMBIEN CR and all medicines out of reach of children.**

General Information about AMBIEN CR

- Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide.
- Do not use AMBIEN CR for a condition for which it was not prescribed.

- Do not share AMBIEN CR with other people, even if you think they have the same symptoms that you have. It may harm them and it is against the law.

This Medication Guide summarizes the most important information about AMBIEN CR. If you would like more information, talk with your doctor. You can ask your doctor or pharmacist for information about AMBIEN CR that is written for healthcare professionals. For more information about AMBIEN CR, call 1-800-633-1610 or visit www.ambienr.com.

What are the ingredients in AMBIEN CR?

Active Ingredient: Zolpidem tartrate

Inactive Ingredients: The 6.25 mg tablets contain: colloidal silicon dioxide, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polyethylene glycol, potassium bitartrate, red ferric oxide, sodium starch glycolate, and titanium dioxide. The 12.5 mg tablets contain: colloidal silicon dioxide, FD&C Blue #2, hypromellose, lactose monohydrate, magnesium stearate, microcrystalline cellulose, polyethylene glycol, potassium bitartrate, sodium starch glycolate, titanium dioxide, and yellow ferric oxide.

Rx Only

This Medication Guide has been approved by the U.S. Food and Drug Administration.

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Bridgewater, NJ 08807

January 2008a

AMBCR-JAN08a-M-Ab

MEDICATION GUIDE
AMBIEN® (ām'bē-ən) **Tablets C-IV**
(zolpidem tartrate)

Read the Medication Guide that comes with AMBIEN before you start taking it and each time you get a refill. There may be new information. This Medication Guide does not take the place of talking to your doctor about your medical condition or treatment.

What is the most important information I should know about AMBIEN?

After taking AMBIEN, you may get up out of bed while not being fully awake and do an activity that you do not know you are doing. The next morning, you may not remember that you did anything during the night. You have a higher chance for doing these activities if you drink alcohol or take other medicines that make you sleepy with AMBIEN. Reported activities include:

- driving a car ("sleep-driving")
- making and eating food
- talking on the phone
- having sex
- sleep-walking

Call your doctor right away if you find out that you have done any of the above activities after taking AMBIEN.

Important:

1. Take AMBIEN exactly as prescribed

- Do not take more AMBIEN than prescribed.
- Take AMBIEN right before you get in bed, not sooner.

2. Do not take AMBIEN if you:

- drink alcohol
- take other medicines that can make you sleepy. Talk to your doctor about all of your medicines. Your doctor will tell you if you can take AMBIEN with your other medicines.
- cannot get a full night's sleep

What is AMBIEN?

AMBIEN is a sedative-hypnotic (sleep) medicine. AMBIEN is used in adults for the short-term treatment of a sleep problem called insomnia. Symptoms of insomnia include:

- trouble falling asleep

AMBIEN is not for children.

AMBIEN is a federally controlled substance (C-IV) because it can be abused or lead to dependence. Keep AMBIEN in a safe place to prevent misuse and abuse. Selling or giving away AMBIEN may harm others, and is against the law. Tell your doctor if you have ever abused or have been dependent on alcohol, prescription medicines or street drugs.

Who should not take AMBIEN?

Do not take AMBIEN if you are allergic to anything in it.

See the end of this Medication Guide for a complete list of ingredients in AMBIEN.

AMBIEN may not be right for you. Before starting AMBIEN, tell your doctor about all of your health conditions, including if you:

- have a history of depression, mental illness, or suicidal thoughts
- have a history of drug or alcohol abuse or addiction
- have kidney or liver disease
- have a lung disease or breathing problems
- are pregnant, planning to become pregnant, or breastfeeding

Tell your doctor about all of the medicines you take including prescription and nonprescription medicines, vitamins and herbal supplements. Medicines can interact with each other, sometimes causing serious side effects. **Do not take AMBIEN with other medicines that can make you sleepy.**

Know the medicines you take. Keep a list of your medicines with you to show your doctor and pharmacist each time you get a new medicine.

How should I take AMBIEN?

- Take AMBIEN exactly as prescribed. Do not take more AMBIEN than prescribed for you.
- **Take AMBIEN right before you get into bed.**
- **Do not take AMBIEN unless you are able to stay in bed a full night (7-8 hours) before you must be active again.**
- For faster sleep onset, AMBIEN should NOT be taken with or immediately after a meal.
- Call your doctor if your insomnia worsens or is not better within 7 to 10 days. This may mean that there is another condition causing your sleep problem.
- If you take too much AMBIEN or overdose, call your doctor or poison control center right away, or get emergency treatment.

What are the possible side effects of AMBIEN?

Serious side effects of AMBIEN include:

- **getting out of bed while not being fully awake and do an activity that you do not know you are doing.** (See “What is the most important information I should know about AMBIEN?”)
- **abnormal thoughts and behavior.** Symptoms include more outgoing or aggressive behavior than normal, confusion, agitation, hallucinations, worsening of depression, and suicidal thoughts or actions.
- **memory loss**
- **anxiety**
- **severe allergic reactions.** Symptoms include swelling of the tongue or throat, trouble breathing, and nausea and vomiting. Get emergency medical help if you get these symptoms after taking AMBIEN.

Call your doctor right away if you have any of the above side effects or any other side effects that worry you while using AMBIEN.

The most common side effects of AMBIEN are:

- drowsiness
- dizziness
- diarrhea
- “drugged feelings”
- You may still feel drowsy the next day after taking AMBIEN. **Do not drive or do other dangerous activities after taking AMBIEN until you feel fully awake.**

After you stop taking a sleep medicine, you may have symptoms for 1 to 2 days such as: trouble sleeping, nausea, flushing, lightheadedness, uncontrolled crying, vomiting, stomach cramps, panic attack, nervousness, and stomach area pain.

These are not all the side effects of AMBIEN. Ask your doctor or pharmacist for more information.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

How should I store AMBIEN?

- Store AMBIEN at room temperature, 68° to 77°F (20° to 25°C).
- **Keep AMBIEN and all medicines out of reach of children.**

General Information about AMBIEN

- Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide.
- Do not use AMBIEN for a condition for which it was not prescribed.
- Do not share AMBIEN with other people, even if you think they have the same symptoms that you have. It may harm them and it is against the law.

This Medication Guide summarizes the most important information about AMBIEN. If you would like more information, talk with your doctor. You can ask your doctor or pharmacist for information about AMBIEN that is written for healthcare professionals. For more information about AMBIEN, call 1-800-633-1610.

What are the ingredients in AMBIEN?

Active Ingredient: Zolpidem tartrate

Inactive Ingredients: hydroxypropyl methylcellulose, lactose, magnesium stearate, micro-crystalline cellulose, polyethylene glycol, sodium starch glycolate, and titanium dioxide. In addition, the 5 mg tablet contains FD&C Red No. 40, iron oxide colorant, and polysorbate 80.

Rx Only

This Medication Guide has been approved by the U.S. Food and Drug Administration.

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Bridgewater, NJ 08807

June 2008

AMB-JUNE08-F-Ac

AMERICA'S FIRST SILVER DOLLAR

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Most Americans would expect to see an authentic Revolutionary War treasure from the 1700's only behind glass in a museum. Now, thanks to a recent discovery of these coins in a centuries old shipwreck, you can actually own America's First Silver Dollar!

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Struck in the New World between 1772 and 1821 in 90.3% fine silver, these Spanish colonial "8 Royals" were authorized by the Continental Congress upon the recommendation of Thomas Jefferson as America's first official coinage. Widely circulated throughout the 13 Colonies, they were used to help fund the American Revolutionary War and earned the title of "America's First Silver Dollar."

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Accepted as legal tender in the U.S. until 1857, each of these hefty silver dollars weighs 27 grams and is 39 mm in diameter. From Europe to China, throughout the Caribbean, and across the 13 Colonies, these silver dollars were readily accepted for trade due to their heft and high silver value.

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America's First Silver Dollars have sold nationally for \$100 to \$295 each. Now, thanks to this exclusive shipwreck treasure discovery, we are able to offer these historic coins for just \$49 (plus s&h)—our best price ever! Or save even more by reserving 5 or more for friends and loved ones for just \$44.00 each.

Your *America's First Silver Dollar* was minted in 1821 or earlier and will come to you mounted in a handsome full color display case. The display panel describes the fascinating story of this classic American Silver Dollar. A signed Certificate of Authenticity accompanies each coin.

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VISIONS OF EARTH



Pakistan Women and children await registration and relief at the Jalozei refugee camp. Since last summer, some one million Pakistanis have fled the fighting between the military and militants near the Afghan border.

PHOTO: EMILIO MORENATTI, AP IMAGES



Greenland Eight hundred miles south of the North Pole, a cavern of stalactite-like stratus clouds—churned by 90-mile-an-hour winds—and the light of a bruised dawn paint an apocalyptic portrait over Inglefield Bay.



PHOTO BRYAN AND CHERRY ALEXANDER



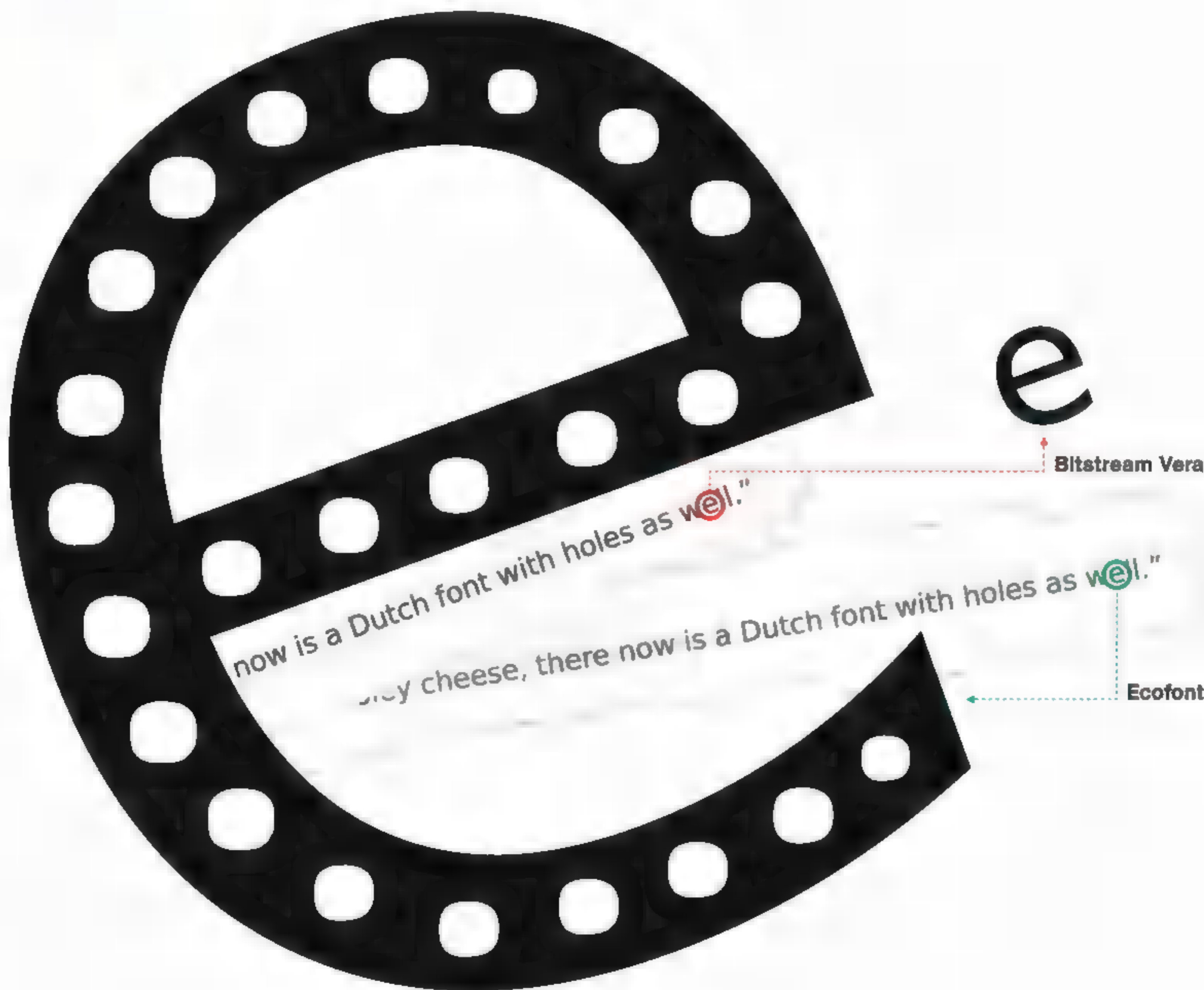
Mexico Thirteen feet and a thousand-plus pounds of great white shark bump a diver's cage and roll the waters off Guadalupe Island. The region, rich in seal and sea lion rookeries, is a hot spot for the powerful predators.



Order prints of *National Geographic* photos online at [PrintsNGS.com](https://www.printsngs.com).

PHOTO: BRANDON COLE





LESS IS MORE

Based on ■ typeface called Bitstream Vera, the Ecofont tends to look best at about 10 points—a bit bigger than the words in the main text on this page. It can be downloaded for free at ecofont.eu.

Holey Grail Are you a green type? The new Ecofont, from the Dutch marketing firm Spranq, aims to be one. Co-owner Alexander Kraaij says it uses less ink than other typefaces, thus saving money and resources. In fact, he contends, a company with 5,000 workers could trim up to \$125,000 ■ year from its printing costs.

The circles are the secret. Spranq found that if it used rounded holes—stars and stripes were too conspicuous—a fifth of a 10-point, Verdana-like letter could be removed without ruining readability. Savings shrink at smaller sizes; holes are obvious at larger ones.

Still, legibility isn't the same as likability. Font scholar Frank Romano dismisses the Ecofont as a gimmick, unsuitable for serif typefaces and inexact ink-jet printers. He also thinks its cheeselike holes are an eyesore: "If I wanted Swiss type, I would use Helvetica."

Kraaij says that's hardly the point. While a professional, multi-alphabet Ecofont is available for publishing, the original is intended primarily for home and internal office jobs. "Even if its use is limited," says Alissa Levin of Manhattan's Point Five Design, "it makes you think hard about ink, not just paper and printers." —Jeremy Berlin

COPD? BREATHE BETTER.

ADVAIR HELPS SIGNIFICANTLY IMPROVE LUNG FUNCTION.*

ADVAIR is different from most other COPD medications because it contains both an anti-inflammatory† and a long-acting bronchodilator working together to help you breathe better. Talk to your doctor and find out if ADVAIR is right for you.

*Measured by a breathing test in people taking ADVAIR 250/50, compared with people taking either fluticasone propionate 250 mcg or salmeterol 50 mcg. Your results may vary.

†It is not known how anti-inflammatories work in COPD.

‡Restrictions apply. See AdvairCOPD.com for eligibility rules.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

§If you smoke and want to quit, you can learn more at way2quit.com.



Important information: ADVAIR DISKUS 250/50 is approved for adults with COPD, including chronic bronchitis, emphysema, or both. You should only take 1 inhalation of ADVAIR twice a day. Higher doses will not provide additional benefits. People with COPD taking ADVAIR may have a higher chance of pneumonia.

Call your doctor if you notice any of the following symptoms: change in amount or color of sputum, fever, chills, increased cough, or increased breathing problems. ADVAIR may increase your risk of osteoporosis and some eye problems (cataracts or glaucoma). You should have regular eye exams. Thrush in the mouth and throat may occur. Tell your doctor if you have a heart condition or high blood pressure before taking ADVAIR. Do not use ADVAIR with long-acting beta₂-agonists for any reason. ADVAIR does not replace fast-acting inhalers for sudden symptoms.

Please see accompanying important information about ADVAIR DISKUS.

Get your first full prescription FREE! Go to AdvairCOPD.com or call 1-800-511-4790.

Partnership for
Prescription Assistance



If you don't have prescription coverage and can't afford your medicines, visit pparx.org, or call 1-888-4PPA-NOW (1-888-477-2669).



GlaxoSmithKline

ADVAIR DISKUS 250/50
(fluticasone propionate 250 mcg and salmeterol 50 mcg inhalation powder)

ADVAIR DISKUS[®] 100/50, 250/50, 500/50 (fluticasone propionate 100, 250, 500 mcg and salmeterol 50 mcg inhalation powder)

What is the most important information I should know about ADVAIR DISKUS?

- In patients with asthma, long-acting beta₂-agonist (LABA) medicines, such as salmeterol (one of the medicines in ADVAIR DISKUS), may increase the chance of death from asthma problems. In a large asthma study, more patients who used salmeterol died from asthma problems compared with patients who did not use salmeterol. It is not known whether fluticasone propionate, the other medicine in ADVAIR DISKUS, changes your chance of death from asthma problems seen with salmeterol. Talk with your healthcare provider about this risk and the benefits of treating your asthma with ADVAIR DISKUS.
- ADVAIR DISKUS does not relieve sudden symptoms. Always have a fast-acting inhaler (short-acting beta₂-agonist medicine) with you to treat sudden symptoms. If you do not have a fast-acting inhaler, contact your healthcare provider to have one prescribed for you.
- Do not stop using ADVAIR DISKUS unless told to do so by your healthcare provider because your symptoms might get worse.
- ADVAIR DISKUS should be used only if your healthcare provider decides that another asthma-controller medicine alone does not control your asthma or that you need 2 asthma-controller medicines.
- Call your healthcare provider if breathing problems worsen over time while using ADVAIR DISKUS. You may need different treatment.
- Get emergency medical care if:
 - breathing problems worsen quickly, and
 - you use your fast-acting inhaler, but it does not relieve your breathing problems.

What is ADVAIR DISKUS?

- ADVAIR DISKUS contains 2 medicines:
 - fluticasone propionate (the same medicine found in FLOVENT[®]), an inhaled corticosteroid medicine. Inhaled corticosteroids help to decrease inflammation in the lungs. Inflammation in the lungs can lead to asthma symptoms.
 - salmeterol (the same medicine found in SEREVENT[®]), a LABA. LABA medicines are used in patients with asthma or chronic obstructive pulmonary disease (COPD). LABA medicines help the muscles around the airways in your lungs stay relaxed to prevent symptoms, such as wheezing and shortness of breath. These symptoms can happen when the muscles around the airways tighten. This makes it hard to breathe. In severe cases, wheezing can stop your breathing and cause death if not treated right away.

Asthma

ADVAIR DISKUS is used long term, twice a day, to control symptoms of asthma and to prevent symptoms such as wheezing in adults and children ages 4 and older.

Chronic Obstructive Pulmonary Disease (COPD)

COPD is a chronic lung disease that includes chronic bronchitis, emphysema, or both. ADVAIR DISKUS 250/50 is used long term, twice a day, to help improve lung function for better breathing in adults with COPD. ADVAIR DISKUS 250/50 has been shown to decrease the number of flare-ups and worsening of COPD symptoms (exacerbations).

Who should not use ADVAIR DISKUS?

Do not use ADVAIR DISKUS:

- to treat sudden, severe symptoms of asthma or COPD
- if you have a severe allergy to milk proteins. Ask your doctor if you are not sure.

Important Information

This brief summary does not take the place of talking to your healthcare provider about your medical condition or treatment.

What should I tell my healthcare provider before using ADVAIR DISKUS?

Tell your healthcare provider about all of your health conditions, including if you:

- have heart problems
- have high blood pressure
- have seizures
- have thyroid problems
- have diabetes
- have liver problems
- have osteoporosis
- have an immune system problem
- are pregnant or planning to become pregnant. It is not known if ADVAIR DISKUS may harm your unborn baby
- are breastfeeding. It is not known if ADVAIR DISKUS passes into your milk and if it can harm your baby
- are allergic to any of the ingredients in ADVAIR DISKUS, any other medicines, or food products
- are exposed to chickenpox or measles

Tell your healthcare provider about ■ the medicines you take, including prescription and nonprescription medicines, vitamins, and herbal supplements. ADVAIR DISKUS and certain other medicines may interact with each other. This may cause serious side effects. Especially, tell your healthcare provider if you take ritonavir. The anti-HIV medicines Norvir[®] (ritonavir capsules) Soft Gelatin, Norvir[®] (ritonavir oral solution), and Kaletra[®] (lopinavir/ritonavir) Tablets contain ritonavir.

Know the medicines you take. Keep a list and show it to your healthcare provider and pharmacist each time you get a new medicine.

How do I use ADVAIR DISKUS?

Do not use ADVAIR DISKUS unless your healthcare provider has taught you and you understand everything. Ask your healthcare provider or pharmacist if you have any questions.

- Children should use ADVAIR DISKUS with an adult's help, ■ instructed by the child's healthcare provider.
- Use ADVAIR DISKUS exactly as prescribed. Do not use ADVAIR DISKUS more often than prescribed. ADVAIR DISKUS comes in 3 strengths. Your healthcare provider will prescribe the one that is best for your condition.
- The usual dosage of ADVAIR DISKUS is 1 inhalation twice a day (morning and evening). The 2 doses should be about 12 hours apart. Rinse your mouth with water after using ADVAIR DISKUS.
- If you take more ADVAIR DISKUS than your doctor has prescribed, get medical help right away if you have any unusual symptoms, such as worsening shortness of breath, chest pain, increased heart rate, or shakiness.
- If you miss a dose of ADVAIR DISKUS, just skip that dose. Take your next dose at your usual time. Do not take 2 doses at one time.
- Do not use a spacer device with ADVAIR DISKUS.
- Do not breathe into ADVAIR DISKUS.
- While you are using ADVAIR DISKUS twice a day, do not use other medicines that contain a LABA for any reason. Ask your healthcare provider or pharmacist if any of your other medicines are LABA medicines.
- Do not change or stop any of your medicines used to control or treat your breathing problems. Your healthcare provider will adjust your medicines as needed.
- Make sure you always have a fast-acting inhaler with you. Use your fast-acting inhaler if you have breathing problems between doses of ADVAIR DISKUS.

Call your healthcare provider or get medical care right away if:

- your breathing problems worsen with ADVAIR DISKUS
- you need to use your fast-acting inhaler more often than usual
- your fast-acting inhaler does not work as well for you at relieving symptoms
- you need to use 4 or more inhalations of your fast-acting inhaler for 2 or more days in a row
- you use 1 whole canister of your fast-acting inhaler in 8 weeks' time
- your peak flow meter results decrease. Your healthcare provider will tell you the numbers that are right for you.
- you have asthma and your symptoms do not improve after using ADVAIR DISKUS regularly for 1 week

What are the possible side effects with ADVAIR DISKUS?

- See "What is the most important information I should know about ADVAIR DISKUS?"
- Patients with COPD have a higher chance of getting pneumonia. ADVAIR DISKUS may increase the chance of getting pneumonia. Call your healthcare provider ■ you notice any of the following symptoms:
 - increase in mucus (sputum) production
 - change in mucus color
 - increased breathing problems
 - increased cough
 - fever
 - chills
- serious allergic reactions. Call your healthcare provider or get emergency medical care if you get any of the following symptoms of a serious allergic reaction, including:
 - rash
 - swelling of the face, mouth, and tongue
 - hives
 - breathing problems
- increased blood pressure
- chest pain
- a fast and irregular heartbeat
- headache
- tremor
- nervousness
- weakened immune system and a higher chance of infections
- lower bone mineral density. This may be a problem for people who already have a higher chance of low bone density (osteoporosis).
- eye problems including glaucoma and cataracts. You should have regular eye exams while using ADVAIR DISKUS.
- slowed growth in children. A child's growth should be checked often.

Other common side effects include:

- hoarseness and voice changes
- throat irritation
- thrush in the mouth and throat
- respiratory tract infections

Tell your healthcare provider about any side effect that bothers you or that does not go away.

These are not all the side effects with ADVAIR DISKUS. Ask your healthcare provider or pharmacist for more information.

Call your doctor for medical advice about side effects. You may report side effects to the FDA at 1-800-FDA-1088.

Ask your healthcare provider or pharmacist for additional information about ADVAIR DISKUS. You can also contact the company that makes ADVAIR DISKUS (toll free) at 1-888-825-5249 or at www.advaair.com.

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This is no joke. There is no catch. Simply call our toll-free number or log on to www.stauer.com. The first 2500 to respond to this ad will get the *Scienza™* lab-created *Ruby Pendant* absolutely FREE. If you're wondering exactly how we can afford to do this... read on.

Why give away jewelry? Our real goal is to build a long term relationship with you. We are convinced you will become a loyal Stauer client in the years to come. But for now, in this lousy economy, offering this remarkable pendant seemed the best way for you to give us a try.

The *Scienza™ Ruby Pendant* features an impressive 1-carat oval-cut, lab-created ruby prong-set in luxurious gold vermeil. Surrounding the radiant red oval are 14 brilliant-cut, lab-created *DiamondAura®* dazzlers. The combination sparkles with a passionate fire that is even brighter than most mined stones.

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The right chemistry is vital in any romantic relationship. We had to get it perfect. That's why the gemologists worked for years to create the world's most romantic, most colorful lab-created ruby. Our *Scienza™* are scientifically grown, crafted in laboratories with precise equipment that recreates the high pressures and heat that nature uses to produce gemstones far beneath the surface of the earth. *Scienza™* are chemically identical to the natural gemstone in hardness and display a better color and sparkle than most mined corundum.

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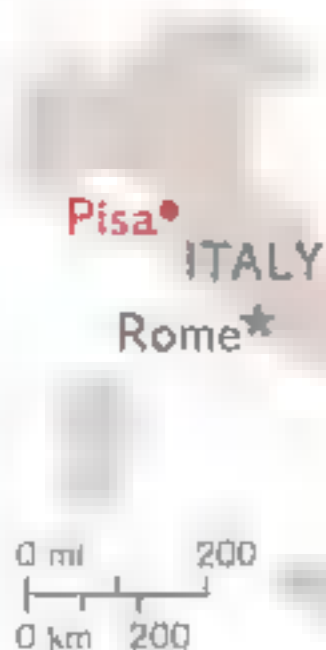
TECHNOLOGY

Full Tilt Of all Pisa's leaning towers—yes, there are several—the famous one is the least likely to topple. That's because an 11-year restoration effort, involving three years of painstaking soil removal, has successfully steadied the precariously poised campanile.

Pisa's soil is mostly compressible clay and sand, which gives way over time and causes big buildings to shift. The iconic edifice started listing northward during its first phase of construction, in the 1100s, then changed course, pitching southward over the next eight centuries.

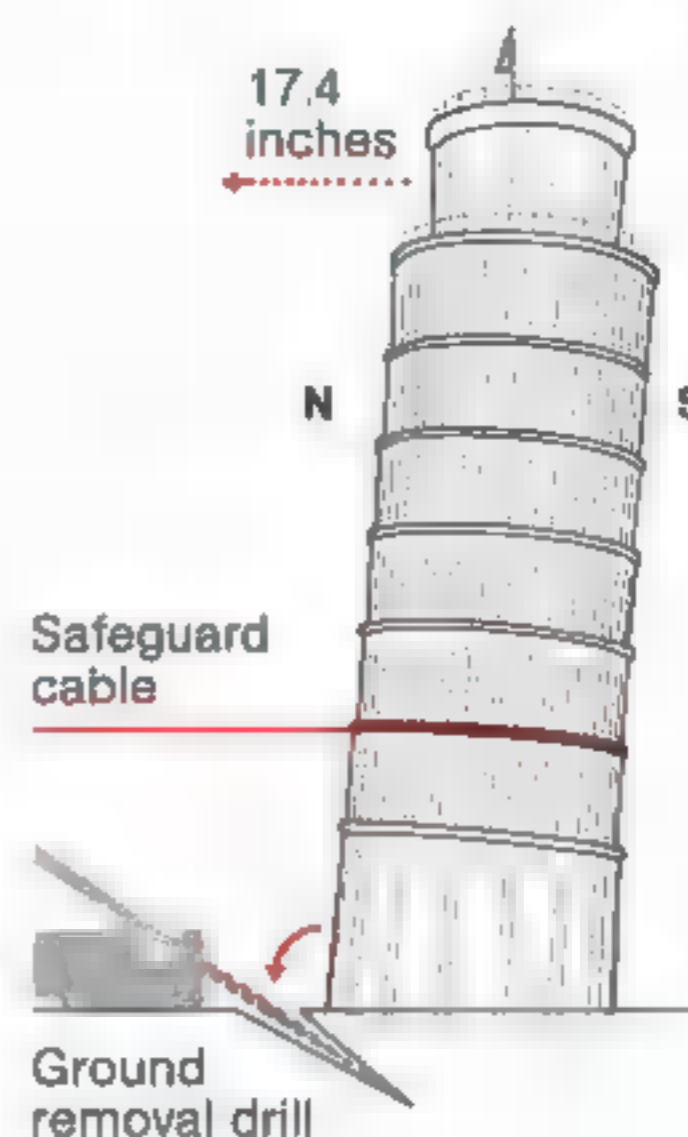
An 1817 measurement put its incline at 5 degrees; by 1990, the cant had increased to 5.5. Fearing the 197-foot-tall, tourist-luring monument might collapse, Italy's premier formed an international team to preserve it.

John Burland, top project engineer, says the tower's tilt is back to 5 degrees, and "over the last two years, almost no movement has been detected." The city's other bell towers, though linked to larger structures, haven't been bolstered. One hopes the Leaning Tower of Pisa won't someday be the Only Tower of Pisa. —Catherine L. Barker

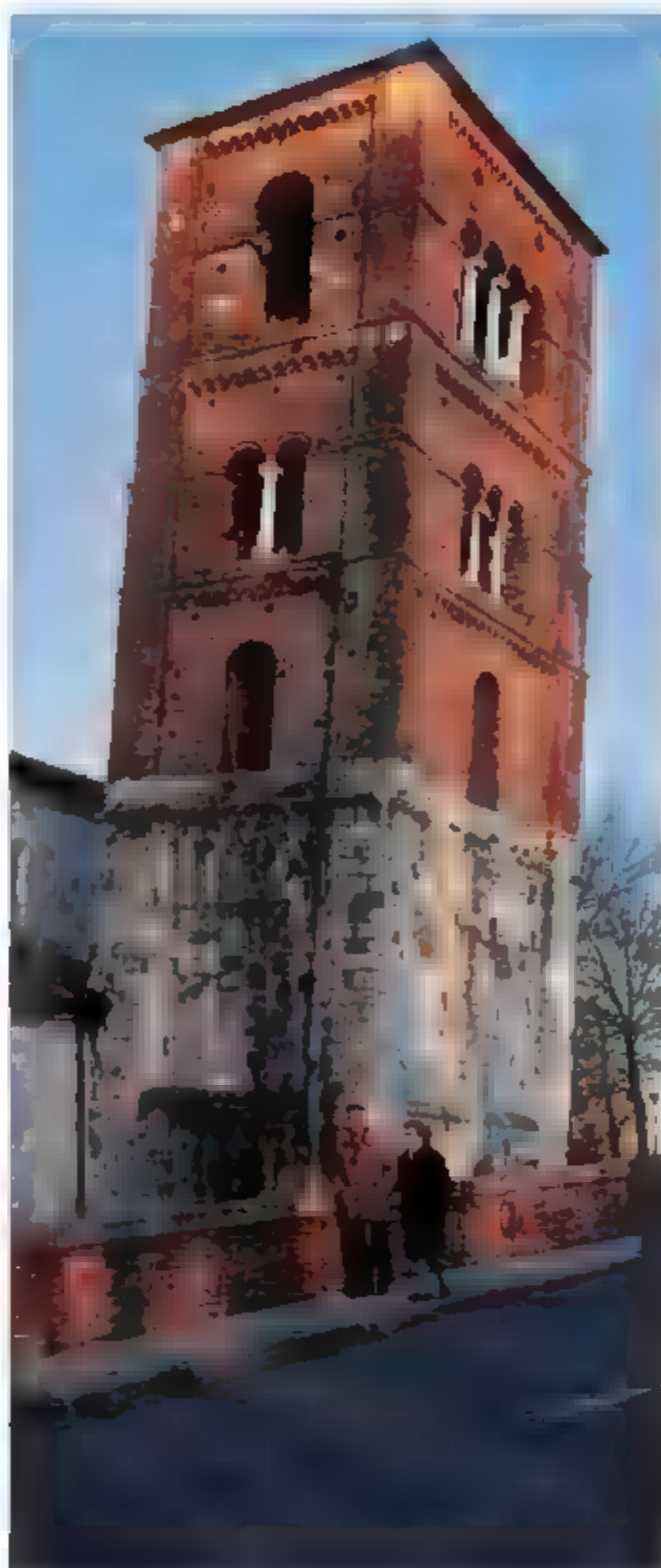


STRAIGHT STORIES

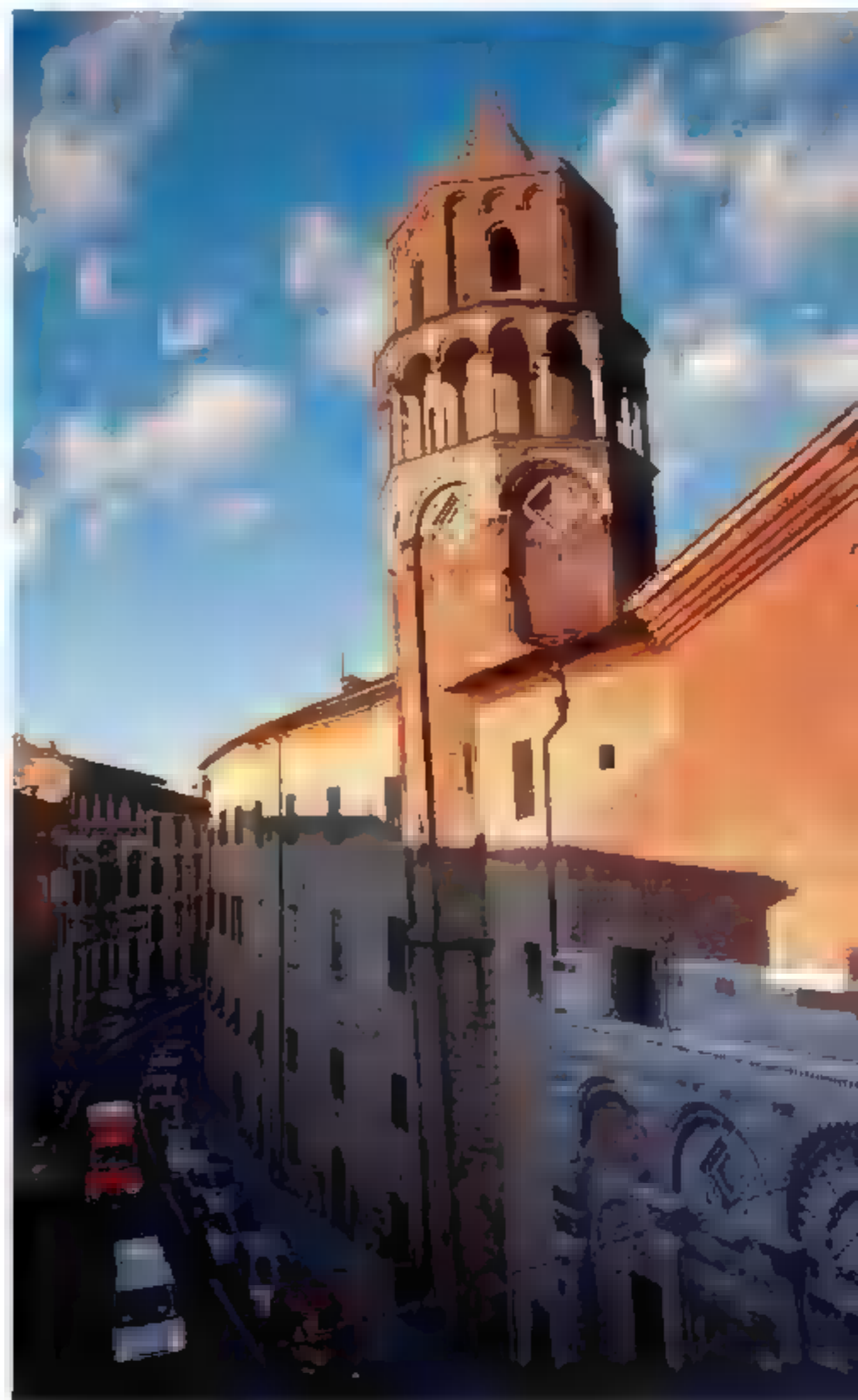
Drilling in 41 places helped level the base, which shifted the tower top nearly 1.5 feet.



La Torre di Pisa
Year completed: circa 1370
Tilt: 5 degrees



San Michele degli Scalzi
Year completed: circa 1100
Tilt: 5 degrees



San Nicola
Year completed: circa 1250
Tilt: 2.5 degrees



Palawan Hornbill (*Anthracoceros marchei*)

Size: Head and body length, 55 - 65 cm (21.7 - 25.6 inches) **Weight:** 601 - 713 g (1.3 - 1.6 lbs)

Habitat: Primary and secondary evergreen forest; also found in mangrove swamps and cultivated areas

Surviving number: Estimated at 2,500 - 10,000



Photographed by Kurt W. Baumgartner

WILDLIFE AS CANON SEES IT

The forest has a friend. The Palawan hornbill fulfills that role beautifully thanks to its dining habits. It gathers fruits in a gular pouch, then processes and spits out seeds where they are able to thrive, away from the competing parent tree. Living in pairs or small groups, the hornbill nests in large trees and ranges from undergrowth to canopy. But trees are in shorter and shorter supply these days — three islands in the hornbill's range are now

largely deforested. With the forest disappearing, poaching persisting and eggs and young being captured for pets or food, the hornbill needs some friends of its own if it is to have a future.

As we see it, we can help make the world a better place. Raising awareness of endangered species is just one of the ways we at Canon are taking action—for the good of the planet we call home. Visit canon.com/environment to learn more.

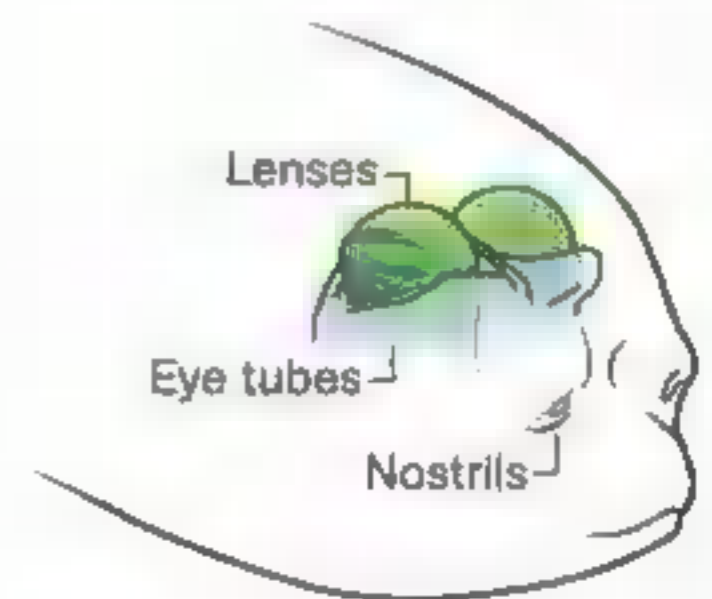
Canon



This four-inch *Macropinna microstoma*, aglow from submersible lights, sports a transparent top to guard its shifty eyes.

Eyes That Surprise Two thousand feet down lurks the baffling barreleye. What look to be its eyes are nostrils. Its real eyes are tubes topped by green lenses adapted to catch light and let the fish judge the gap from mouth to meal. (The pigment filters downwelling light, making prey easier to see.) On top, a fluid-filled dome shields the eyes from stinging animals without blocking the view.

Until recently scientists thought those baby greens were locked in place, compounding a problem caused by their shape: extreme tunnel vision. But this created a paradox. How does a fish that can only look up nab prey with a mouth that faces front? Now, with video and specimens captured from 2,000 feet below by a remotely operated vehicle, Bruce Robison and Kim Reisenbichler of the Monterey Bay Aquarium Research Institute have solved the puzzle: The eyes are actually quite mobile. In the “up” (default) position they track food, such as krill falling from above. Then, muscles twitch and pop the eyes forward to help the fish aim its bite. A barreleye also cruises under jellies, eyeing food caught in their tentacles. Choosing a target, it swings its body vertical and its eyes front, then swipes the spoils. Like many deep-sea occupants, these fish seem downright peculiar when examined up close, says Robison. “But they’re actually nicely suited to the lives they lead.” —Jennifer S. Holland



STRANGE SIGHT

The barreleye's eyes can flit forward. Muscles outside the tubes make the shift possible.

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ARCHAEOLOGY

Cradle of a Legend Graves laden with luxuries offer ■ revealing new look at the wealthy military culture that gave birth to Alexander the Great. Excavations in Archontiko have uncovered 450 tombs from the sixth century B.C. Archaeologists Pavlos and Anastasia Chrysostomou, of the Greek Ministry of Culture, describe scores of warriors whose armor, swords, and shoes sparkled with gold and silver as well as noblewomen adorned with gold, silver, amber, and faience. Other funerary items—a scarab from Egypt, ceramics from the eastern Mediterranean—foreshadow the empire that the fabled Macedonian general would conquer 200 years later. —A. R. Williams

● Archontiko

GREECE

★ Athens

0 m 100
0 km 100

A gold mask and gold-trimmed helmet, seen here on a mannequin, were found in a Macedonian warrior's grave.

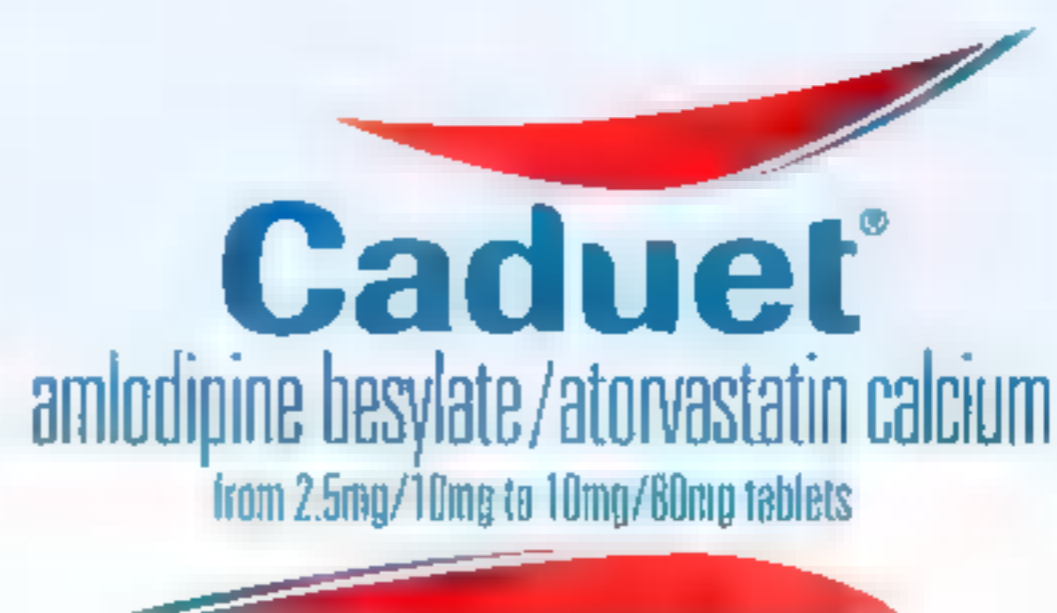


PHOTO: GIANLUCA COLLA
NGM MAPS

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blood pressure and cholesterol goals?”**



Ask your doctor if **Caduet** can help you go for both your goals.



In a clinical study of patients with slightly elevated blood pressure and cholesterol, **Caduet helped 48% reach both goals in just 4 weeks.** Not all patients will reach their blood pressure and cholesterol goals. Individual results will vary.

Only Caduet combines the two proven medicines, Norvasc (amlodipine besylate) for high blood pressure and Lipitor (atorvastatin calcium) for high cholesterol, in a single pill to significantly lower both, when diet and exercise are not enough.

Ask your doctor if Caduet can help you go for both your goals and visit www.caduet.com to learn more.

IMPORTANT INFORMATION:

Caduet is a prescription drug that combines 2 medicines, Norvasc and Lipitor. Norvasc is used to treat high blood pressure (hypertension), chest pain (angina) or blocked arteries of the heart (coronary artery disease); Lipitor is used along with diet and exercise to lower high cholesterol. It is also used to lower the risk of heart attack and stroke in people with multiple risk factors for heart disease such as family history, high blood pressure, age, low HDL-C, or smoking.

Caduet is not for everyone. It is not for those with liver problems. And it is not for women who are nursing, are pregnant, or may become pregnant. If you take Caduet, tell

your doctor if you feel any new muscle pain or weakness. This could be a sign of rare but serious muscle side effects. Tell your doctor about all of the medicines you take. This may help avoid serious drug interactions. Your doctor should do blood tests to check your liver function before and during treatment and may adjust your dose. If you have any heart problems, be sure to tell your doctor. The most common side effects are edema, headache, and dizziness. They tend to be mild and often go away.

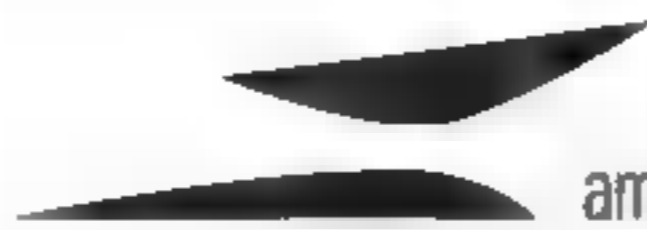
Caduet can be used alone or with other high blood pressure medicines. Caduet is one of many options for treating high blood pressure and high cholesterol, in addition to diet and exercise, that you or your doctor can consider.

Please see the accompanying patient information on the following page.

You are encouraged to report negative side effects of prescription drugs to the FDA.

Visit www.FDA.gov/medwatch or call 1-800-FDA-1088.

IMPORTANT FACTS



Caduet[®] (CAD-oo-et)
amlodipine besylate/atorvastatin calcium

LOWERING YOUR HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL

High blood pressure and high cholesterol are more than just numbers. They are risk factors that should not be ignored. If your doctor said you have high blood pressure and high cholesterol, you may be at an increased risk for heart attack or stroke. But the good news is, you can take steps to lower your blood pressure and cholesterol.

With the help of your doctor and a medicine like CADUET, along with diet and exercise, you could be on your way to lowering your blood pressure and cholesterol. Ready to start eating right and exercising more? Talk to your doctor and visit the American Heart Association at www.americanheart.org.

WHO IS CADUET FOR?

Who can take CADUET:

- Adults who need to lower their blood pressure AND who cannot lower their cholesterol enough with diet and exercise

Who should NOT take CADUET:

- Women who are pregnant, may be pregnant, or may become pregnant. CADUET may harm your unborn baby. If you become pregnant, stop CADUET and call your doctor right away.
- Women who are breast-feeding. CADUET can pass into your breast milk and may harm your baby.
- People with liver problems
- People allergic to anything in CADUET

BEFORE YOU START CADUET

Tell your doctor:

- About all the medicines you take, including prescription and nonprescription medicines, vitamins, and herbal supplements
- If you ever had heart disease
- If you have muscle aches or weakness
- If you drink more than 2 glasses of alcohol daily
- If you have diabetes or kidney problems
- If you have thyroid problems

ABOUT CADUET

CADUET is a prescription medicine that combines Norvasc[®] (amlodipine besylate) for high blood pressure and Lipitor[®] (atorvastatin calcium) for high cholesterol in one pill. CADUET, along with diet and exercise, treats both high blood pressure (hypertension) and high cholesterol. CADUET can lower the risk of heart attack or stroke in patients with risk factors for heart disease—such as heart disease in the family, high blood pressure, being older than 55, having low HDL-C, diabetes, or smoking.

POSSIBLE SIDE EFFECTS OF CADUET

Serious side effects in a small number of people:

Muscle problems that can lead to kidney problems. This includes kidney failure. You have a higher chance for muscle problems if you take certain other medicines with CADUET.

Liver problems. Your doctor may do blood tests to check your liver before you start CADUET and while you are taking it.

Symptoms of muscle or liver problems include:

- Unexplained muscle weakness or pain, especially if you have a fever or feel very tired
- Nausea, vomiting, or stomach pain
- Brown or dark-colored urine
- Feeling more tired than usual
- Your skin and the whites of your eyes turn yellow

If you have these symptoms, call your doctor right away.

Chest pain. Sometimes chest pain that does not go away or gets worse or a heart attack can happen. If this happens, call your doctor or go to the emergency room right away.

Common side effects of CADUET include:

- headache
- constipation
- swelling of legs or ankles
- gas
- feeling dizzy
- upset stomach and stomach pain

These side effects are usually mild and go away. There are other side effects of CADUET. Ask your doctor or pharmacist for a complete list.

HOW TO TAKE CADUET

Do:

- Take CADUET once a day as prescribed by your doctor.
- Try to eat heart-healthy foods while you take CADUET.
- Take CADUET at any time of day, with or without food.
- If you miss a dose, take it as soon as you remember. But if it has been more than 12 hours since your missed dose, wait. Take the next dose at your regular time.

Don't:

- Do not break CADUET tablets before taking them.
- Do not stop taking nitroglycerin, if you take it for angina.
- Do not change or stop your dose before talking with your doctor.
- Do not start new medicines or stop any medicines you are taking before talking to the doctor.

NEED MORE INFORMATION?

- Ask your doctor, health-care provider, or pharmacist. This is only a summary of the most important information.
- Go to www.caduet.com or call (866) 514-0900.

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Death Knell In the early 1800s an Englishman could be hanged for stealing a shirt. By the end of the 1900s, growing concern for individual rights had caused the death penalty to disappear from the United Kingdom and nearly everywhere else in the Western world. Two exceptions are Belarus and the United States, although this year New Mexico became the 15th state to outlaw capital punishment. Death-penalty opponents cite the exoneration of 131 people on death row since 1973 as well as the high cost of capital cases.



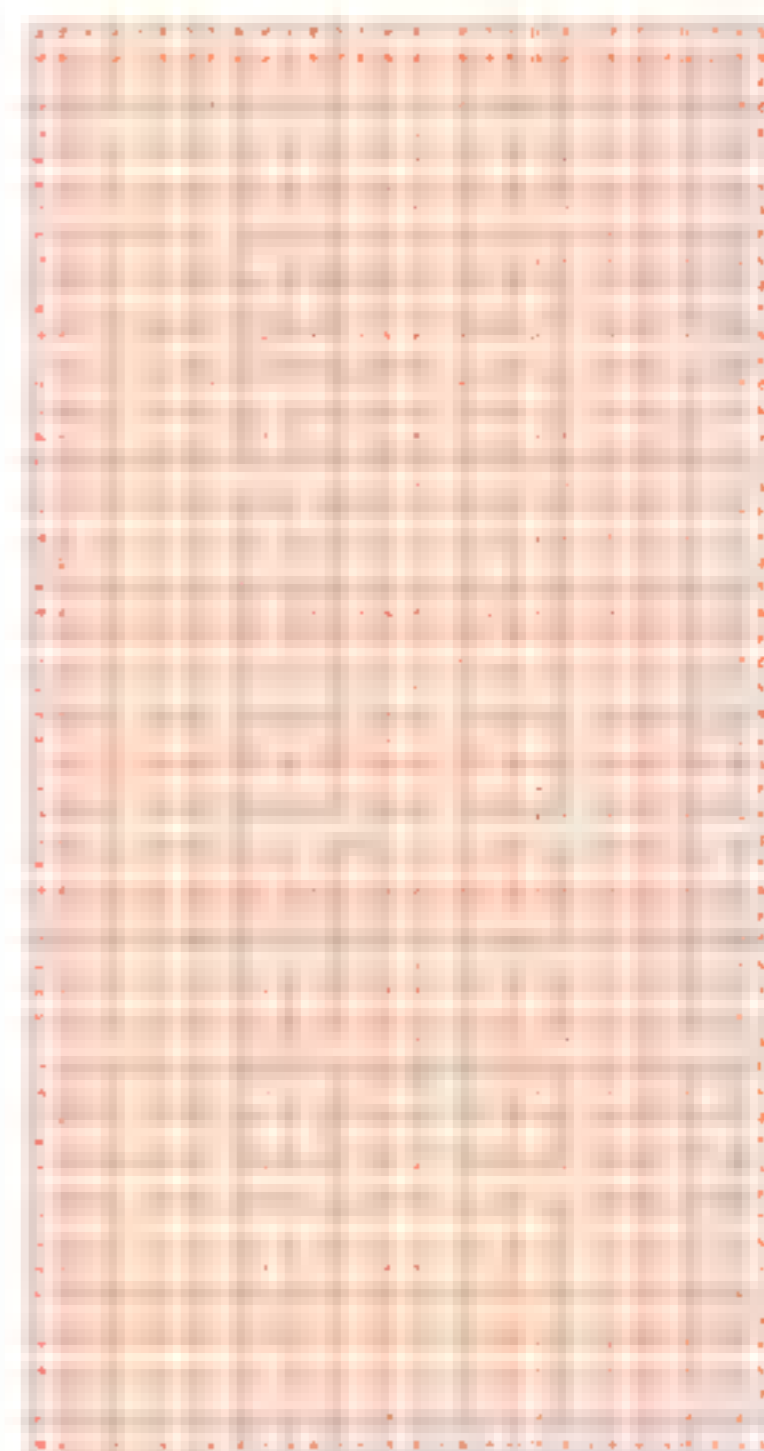
Defenders argue that the penalty offers justice and cite some studies that show it's a deterrent. The practice is strong in culturally conservative areas—Japan, Saudi Arabia, Texas—and totalitarian regimes.

Elsewhere, opposition is mounting. Indian activists believe capital punishment is a violation of the right to life (left). In most countries where

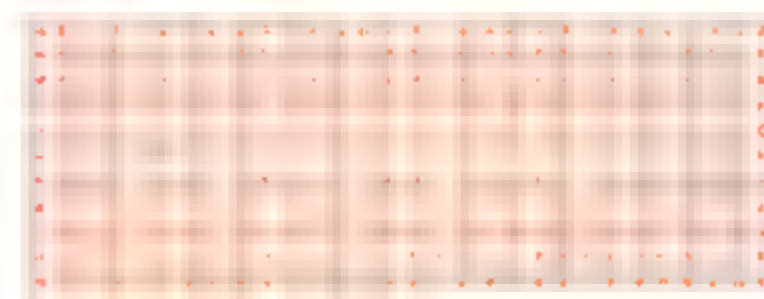
the penalty is still on the books, it is used less and less, notes Piers Bannister of Amnesty International's London office. He believes global opinion will eventually bring an end to executions. "Not in my lifetime," says Bannister, 47, "but in my children's." —Karen E. Lange

DEATH ROWS

In 2008 there were official reports of 2,390 executions in 25 countries.



1,718 China



346 Iran



102 Saudi Arabia



37 United States



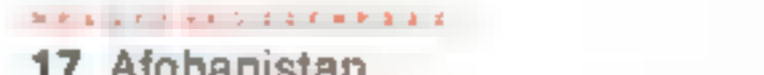
36 Pakistan



34 Iraq



19 Vietnam



17 Afghanistan



15 North Korea



15 Japan



13 Yemen



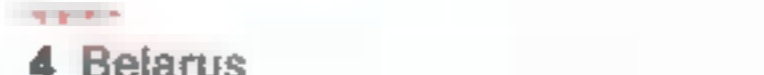
10 Indonesia



8 Libya



5 Bangladesh

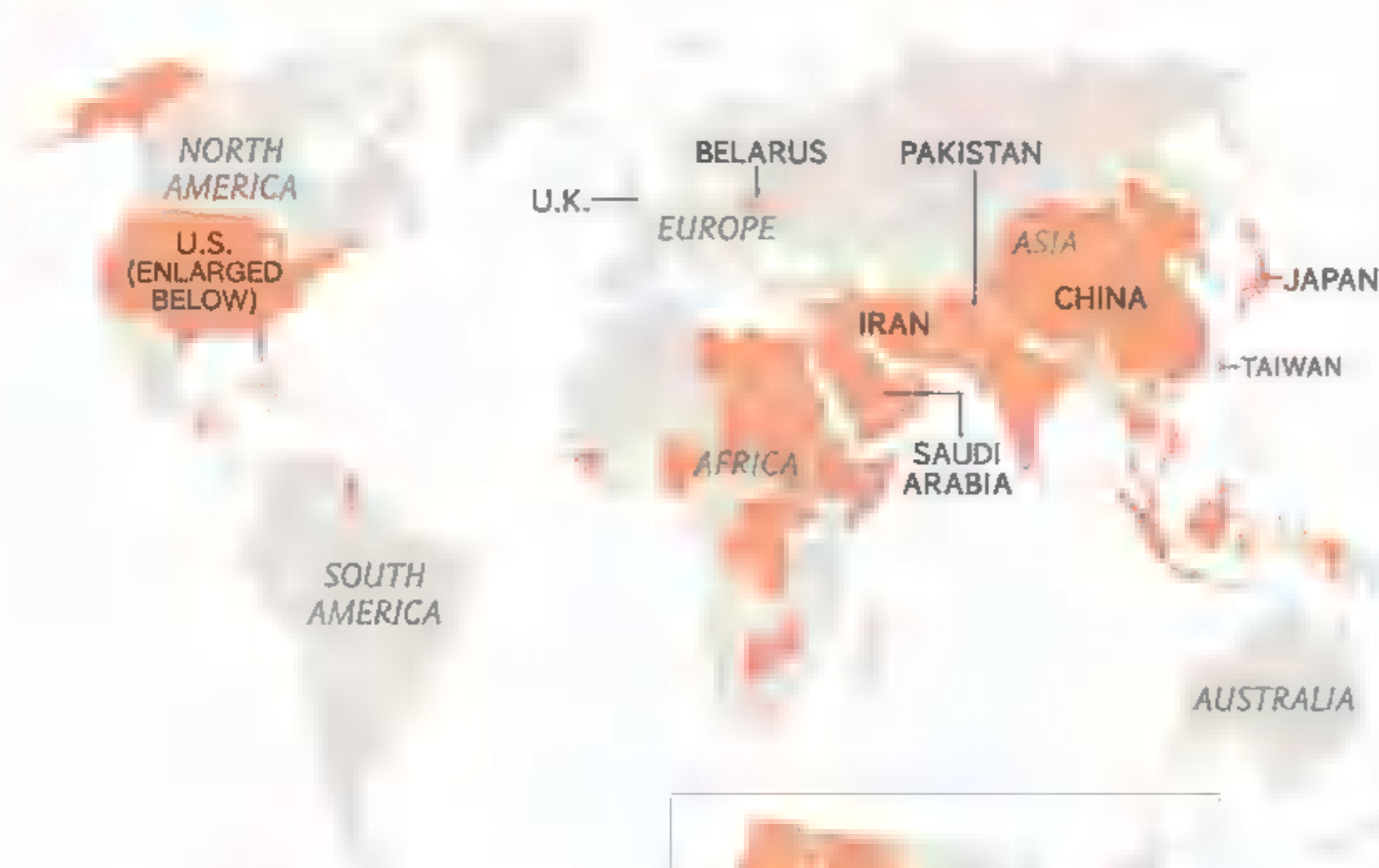


4 Belarus

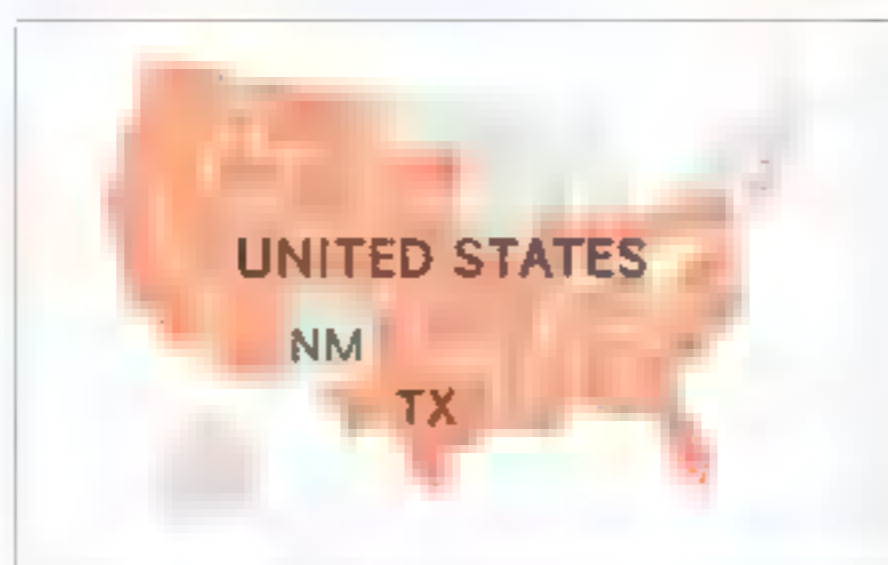


2 Egypt

1 each Bahrain, Botswana, Malaysia, Mongolia, St. Kitts and Nevis, Singapore, Sudan, Syria, United Arab Emirates



PENAL MODE Only 56 countries, plus Taiwan and the Palestinian territories, apply the death penalty for civilian, peacetime crimes (map, in orange). Another 36 countries have the law on the books but no longer use it.



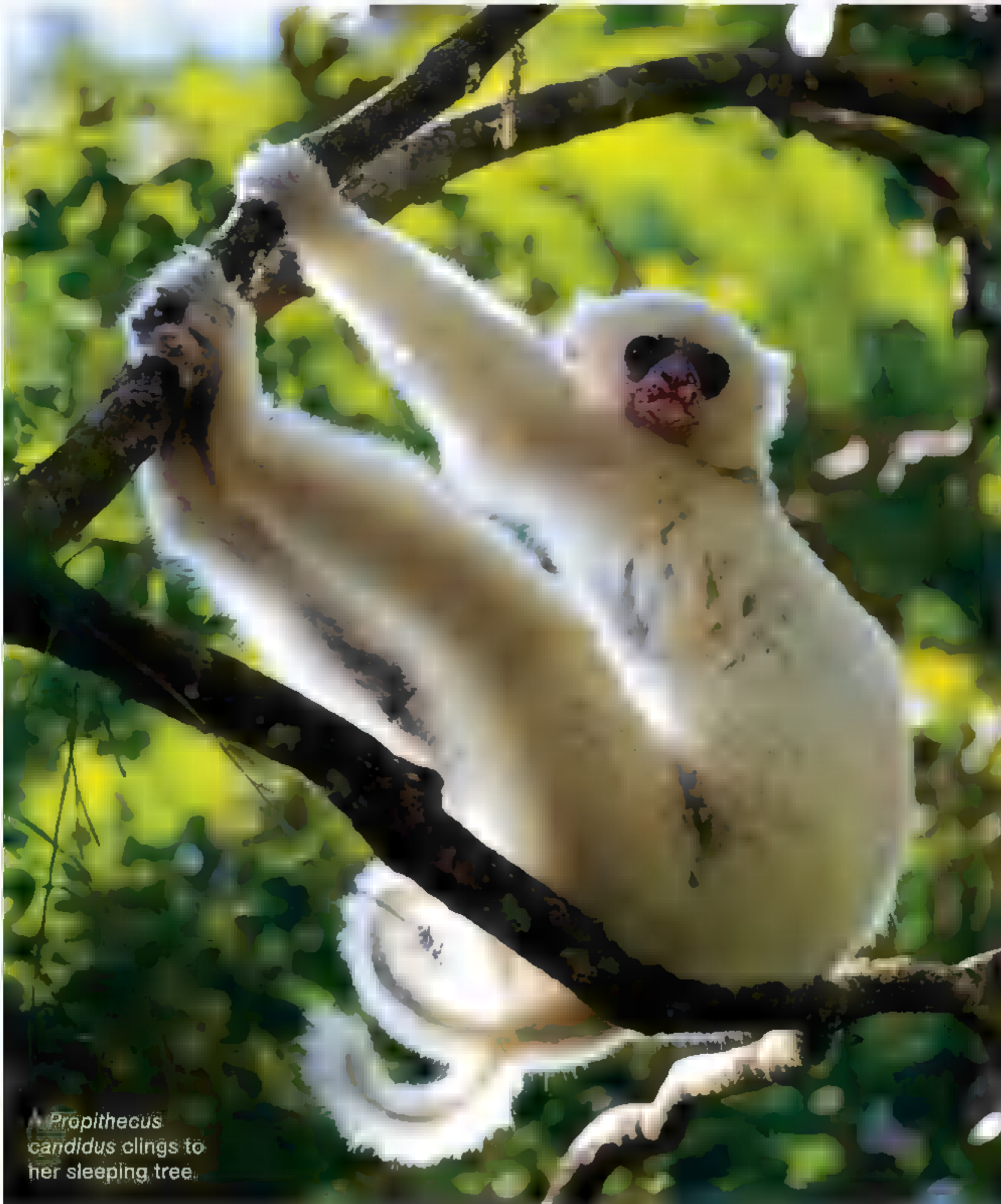
Of the 35 states with a death penalty, some have a moratorium on its use.



WHAT IF CHURCH LED MORE PEOPLE TO WATER?

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Propithecus candidus clings to her sleeping tree.



Losing Lemurs They're fuzzy, white, and vocal, but maybe the most remarkable thing about them, says primatologist Erik Patel, is how few there are. He's talking about the silky sifaka, a lemur that lives in only a few patches of high-altitude forest on Madagascar. Patel has found that fewer than a thousand remain. Like other lemurs, the silky sifaka is hunted for meat and is seeing its habitat slashed and burned to clear space for rice fields. Patel hopes that 12 new bungalows near the sifakas' territory in Marojejy National Park will attract tourists—and that the money visitors bring will get locals excited about protecting lemurs too. —Helen Fields

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A Flavor Far Afield Vanilla is definitely not plain. In fact, it's full of surprises. For instance, says economic botanist Pesach Lubinsky, a wild vanilla orchid flower "actually smells like cinnamon." Then there's pollination: Only one Central American bee is thought to do it; everywhere else people move the pollen by hand. Most vanilla today grows in Madagascar, oceans away from that bee. Vanilla took off in Europe in the 1600s, after the Spanish brought beans back from Mexico. But no one outside the New World could get it to bear fruit until 1841, when a slave on the island of Reunion worked out the hand-pollination technique still used today. The most cultivated species is *Vanilla planifolia* (above). The runner-up is *Vanilla tahitensis*, or Tahitian vanilla, which has never been seen in the wild. Last year Lubinsky used DNA to determine that it's a hybrid of two other species, probably brought together by Maya growing it for chocolate. It rode on Spanish galleons to the Philippines, then to Tahiti with the French—just part of vanilla's world tour. —Helen Fields

See The Bigger Picture

Biodiversity Photo Contest



Renowned National Geographic photographer Joel Sartore brings us face-to-face with biodiversity loss. His photographs of endangered species often give the world a final glimpse of vanishing life.

A world of amazing connections "Biodiversity is beautiful. The spectacular variety of life on Earth keeps our planet healthy and balanced. When I travel the world as a photographer, I see that the intricate connections between all species—from the smallest insects to the largest trees—are fragile and threatened. When we lose species we lose connections and that can trigger chain reactions reaching all the way to you and me. In parts of the world, bees have vanished, so people now have to hand-pollinate fruits and vegetables with feathers. When snake species are lost, mouse populations skyrocket, invading our crops. As chameleons, other reptiles, and amphibians vanish, massive numbers of insects will remain uneaten, many of which carry disease to humans. Trees and other plants that are so invaluable in providing medicines and cleaning our soil, water, and air are disappearing faster than ever before.

The one thing we can't lose is hope. We still have time to turn things around. Our children will inherit a world rich—or poor—in biodiversity based on how much we preserve and protect today. My photos are my way of asking us all to stop, look, and care."



Get your children to stop and look and enter the See The Bigger Picture Photo Contest.

Submit photos, learn more about biodiversity, and see full contest rules at

www.seethebiggerpicture.org

Airbus sees the bigger picture, and works to minimize environmental impact by reducing greenhouse gas emissions, lowering fuel consumption, and creating quieter, more efficient aircraft. Airbus created the first aircraft recycling program of its kind in the world, and earned the ISO 14001 Environmental Certification. Together, Airbus and National Geographic support the UN-backed project, *The Green Wave*, in the world's most far-reaching biodiversity program to children, youth, and families.





The baseball-cap-style helmet on this Hanoi rider was banned in 2008 for failing to meet safety standards.



Helmet Headway The Vietnamese used to hate motorcycle helmets. They called them “rice cookers”—hot and heavy on the head. They were not fans of helmet hair. In a nation of 26 million motorbikes, maybe one in three riders buckled in. That was before a December 2007 law levied fines of up to \$12 on helmetless heads. Today most adult riders are helmeted; traffic fatalities fell by 1,400 in the first year of enforcement. Tran Le Tra, 37, of Hanoi, misses the wind in his hair but admits, “I feel safer.”

Children aren’t safer. Tucked between mom and dad, many ride bareheaded. Rumors have spread that helmet straps can harm young necks, says Jean-Marc Olivé, a World Health Organization representative. The law can’t touch negligent parents or kids under 16. WHO and the Asia Injury Prevention Foundation hope to help the government close loopholes—and change mind-sets. —Marc Silver



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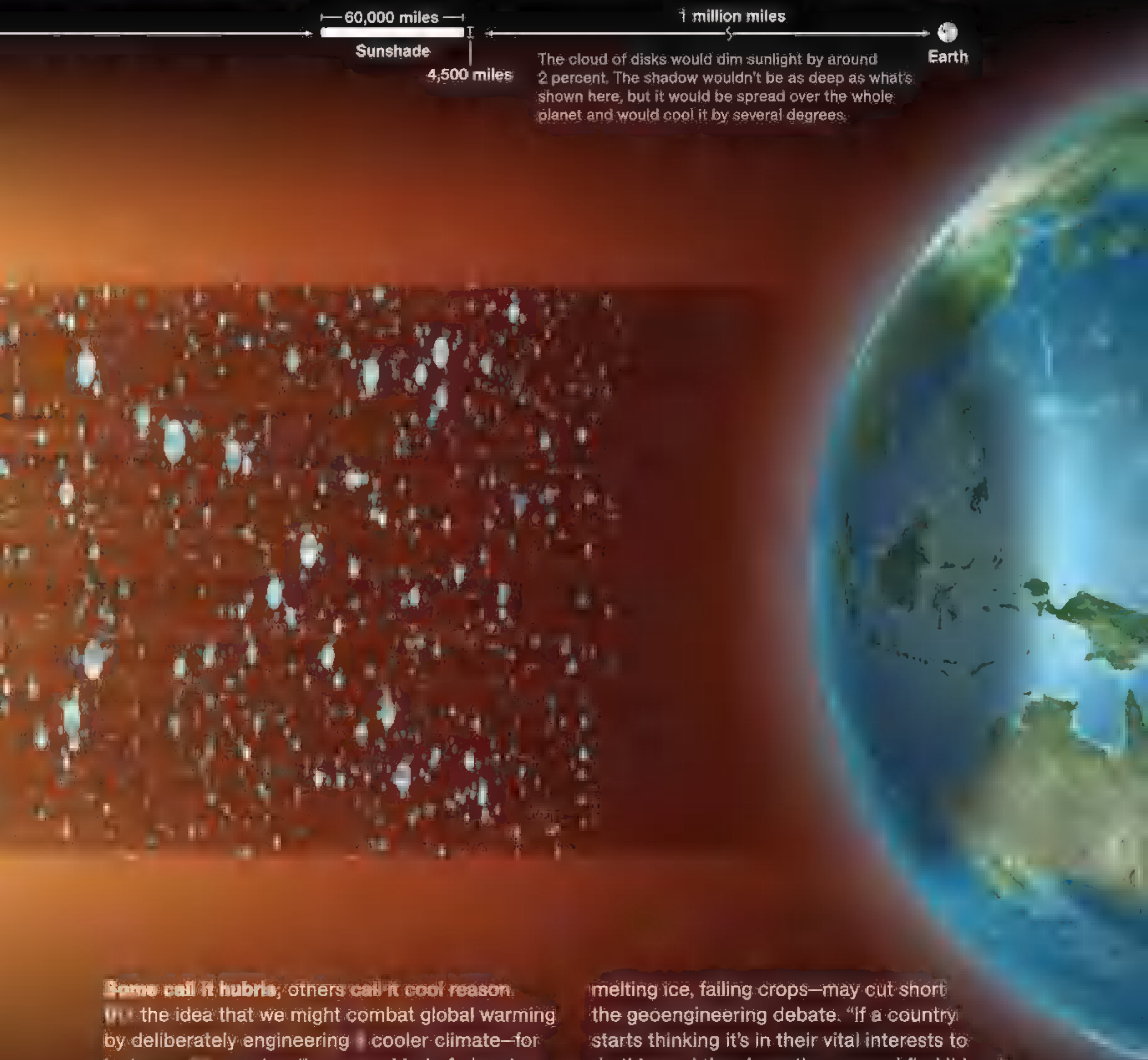
Sun

92 million miles

Astronomer Roger Angel has proposed a far-out sunshade: trillions of two-foot-wide sun defectors orbiting a million miles from Earth.

Shading the Earth

If we don't cut fossil fuels fast enough, global warming may get out of hand. Some scientists say we need a plan B: a giant sunshade that would cool the whole planet.

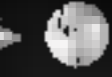


60,000 miles

Sunshade

4,500 miles

1 million miles



Earth

The cloud of disks would dim sunlight by around 2 percent. The shadow wouldn't be as deep as what's shown here, but it would be spread over the whole planet and would cool it by several degrees.

Some call it hubris; others call it cool reason. The idea that we might combat global warming by deliberately engineering a cooler climate—for instance, by constructing some kind of planetary sunshade—has lately migrated from the fringe to the scientific mainstream. We are already modifying climate by accident, say proponents of geoengineering; why not do something intentional and intelligent to stop it? Hold on, say critics. Global warming shows we understand the Earth too little to engineer it without unintended and possibly disastrous consequences. Both sides worry that facts on the ground—rising seas,

melting ice, failing crops—may cut short the geoengineering debate. “If a country starts thinking it’s in their vital interests to do this, and they have the power, I find it hard to imagine them not doing it,” says Ken Caldeira, a climate expert at the Carnegie Institution. Caldeira is talking about the easiest, cheapest form of geoengineering: building a sunshade in the stratosphere out of millions of tons of tiny reflective particles, such as sulfate. Planes, balloons, battleship guns pointed upward—there is no shortage of possible delivery vehicles. And there is little doubt you could cool Earth

**IMAGINE THIS BLISTERING RASH
ALONG WITH STABBING PAIN**



**AND YOU'LL HAVE AN IDEA OF
WHAT IT CAN BE LIKE TO HAVE SHINGLES.**



For more information on the availability of ZOSTAVAX through the Merck Vaccine Patient Assistance Program, visit ZOSTAVAX.com/freevaccines or call 1-877-9 SHINGLES.

IF YOU HAD CHICKENPOX AS A CHILD, YOU COULD GET SHINGLES NOW.

The chickenpox virus is still in your body.

It can resurface as Shingles, a painful, blistering rash. The Shingles rash usually lasts up to 30 days, and for most the pain lessens as the rash heals. But some people who develop Shingles experience long-term pain that can last for months, even years.

ZOSTAVAX is the only vaccine that can prevent Shingles.

ZOSTAVAX is used to prevent Shingles in adults 60 years of age or older. Once you reach age 60, the sooner you get vaccinated, the better your chances of protecting yourself from Shingles. ZOSTAVAX is given as a single shot. ZOSTAVAX cannot be used to treat Shingles once you have it. Talk to your health care professional to see if ZOSTAVAX is right for you.

Important Safety Information

ZOSTAVAX may not fully protect everyone who gets the vaccine. You should not get ZOSTAVAX if you are allergic to any of its ingredients, including gelatin and neomycin, have a weakened immune system, take high doses of steroids, or are pregnant or plan to become pregnant. Possible side effects include redness, pain, itching, swelling, warmth, or bruising at the injection site, as well as headache. You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088. Before getting vaccinated, talk to your health care professional about situations you may need to avoid after getting ZOSTAVAX. Please see the Patient Product Information on the adjacent page.

Before you get **Shingles**, ask about ZOSTAVAX.

ZOSTAVAX[®]
Zoster Vaccine Live

www.zostavax.com

9815607

**Patient Information about
ZOSTAVAX® (pronounced "ZOS tah vax")
Generic name: Zoster Vaccine Live**

You should read this summary of information about ZOSTAVAX* before you are vaccinated. If you have any questions about ZOSTAVAX after reading this leaflet, you should ask your health care provider. This information does not take the place of talking about ZOSTAVAX with your doctor, nurse, or other health care provider. Only your health care provider can decide if ZOSTAVAX is right for you.

What is ZOSTAVAX and how does it work?

ZOSTAVAX is a vaccine that is used for adults 60 years of age or older to prevent shingles (also known as zoster).

ZOSTAVAX contains a weakened chickenpox virus (varicella-zoster virus).

ZOSTAVAX works by helping your immune system protect you from getting shingles. If you do get shingles even though you have been vaccinated, ZOSTAVAX may help prevent the nerve pain that can follow shingles in some people.

ZOSTAVAX may not protect everyone who gets the vaccine. ZOSTAVAX cannot be used to treat shingles once you have it.

What do I need to know about shingles and the virus that causes it?

Shingles is caused by the same virus that causes chickenpox. Once you have had chickenpox, the virus can stay in your nervous system for many years. For reasons that are not fully understood, the virus may become active again and give you shingles. Age and problems with the immune system may increase your chances of getting shingles.

Shingles is a rash that is usually on one side of the body. The rash begins as a cluster of small red spots that often blister. The rash can be painful. Shingles rashes usually last up to 30 days and, for most people, the pain associated with the rash lessens as it heals.

Who should not get ZOSTAVAX?

You should not get ZOSTAVAX if you:

- are allergic to any of its ingredients.
- are allergic to gelatin or neomycin.
- have a weakened immune system (for example, an immune deficiency, leukemia, lymphoma, or HIV/AIDS).
- take high doses of steroids by injection or by mouth.
- are pregnant or plan to get pregnant.

You should not get ZOSTAVAX to prevent chickenpox.

Children should not get ZOSTAVAX.

How is ZOSTAVAX given?

ZOSTAVAX is given as a single dose by injection under the skin.

What should I tell my health care provider before I get ZOSTAVAX?

You should tell your health care provider if you:

- have or have had any medical problems.
- take any medicines, including nonprescription medicines, and dietary supplements.
- have any allergies, including allergies to neomycin or gelatin.
- had an allergic reaction to another vaccine.
- are pregnant or plan to become pregnant.
- are breast-feeding.

Tell your health care provider if you expect to be in close contact (including household contact) with newborn infants, someone who may be pregnant and has not had chickenpox or been vaccinated against chickenpox, or someone who has problems with their immune system. Your health care provider can tell you what situations you may need to avoid.

What are the possible side effects of ZOSTAVAX?

The most common side effects that people in the clinical studies reported after receiving the vaccine include:

- redness, pain, itching, swelling, warmth, or bruising where the shot was given.
- headache.

The following additional side effects have been reported in general use with ZOSTAVAX:

- allergic reactions, which may be serious and may include difficulty in breathing or swallowing. If you have an allergic reaction, call your doctor right away.
- fever.
- rash.
- swollen glands near the injection site (that may last a few days to a few weeks).

Tell your health care provider if you have any new or unusual symptoms after you receive ZOSTAVAX.

What are the ingredients of ZOSTAVAX?

Active Ingredient: a weakened form of the varicella-zoster virus.

Inactive Ingredients: sucrose, hydrolyzed porcine gelatin, sodium chloride, monosodium L-glutamate, sodium phosphate dibasic, potassium phosphate monobasic, potassium chloride.

What else should I know about ZOSTAVAX?

Vaccinees and their health care providers are encouraged to call 1-800-986-8999 to report any exposure to ZOSTAVAX during pregnancy.

This leaflet summarizes important information about ZOSTAVAX.

If you would like more information, talk to your health care provider or visit the website at www.ZOSTAVAX.com or call 1-800-622-4477.

Rx only

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Mount Pinatubo's cloud of ash and pumice was deadly, but the whole Earth was cooled by its sulfur.

that way, because volcanoes already do it. After Mount Pinatubo erupted in the Philippines in 1991, launching ten million tons of sulfur into the stratosphere and spreading a sun-dimming haze around the planet, the average temperature dropped by about ■ degree Fahrenheit for a year. With carefully designed particles, geoengineers might make do with a fraction of that tonnage—though because they fall out of the stratosphere, the particles would have to be delivered continually, year after year. Still, says Caldeira, the sulfate scheme would be “essentially free compared with the other costs of mitigating climate change.”

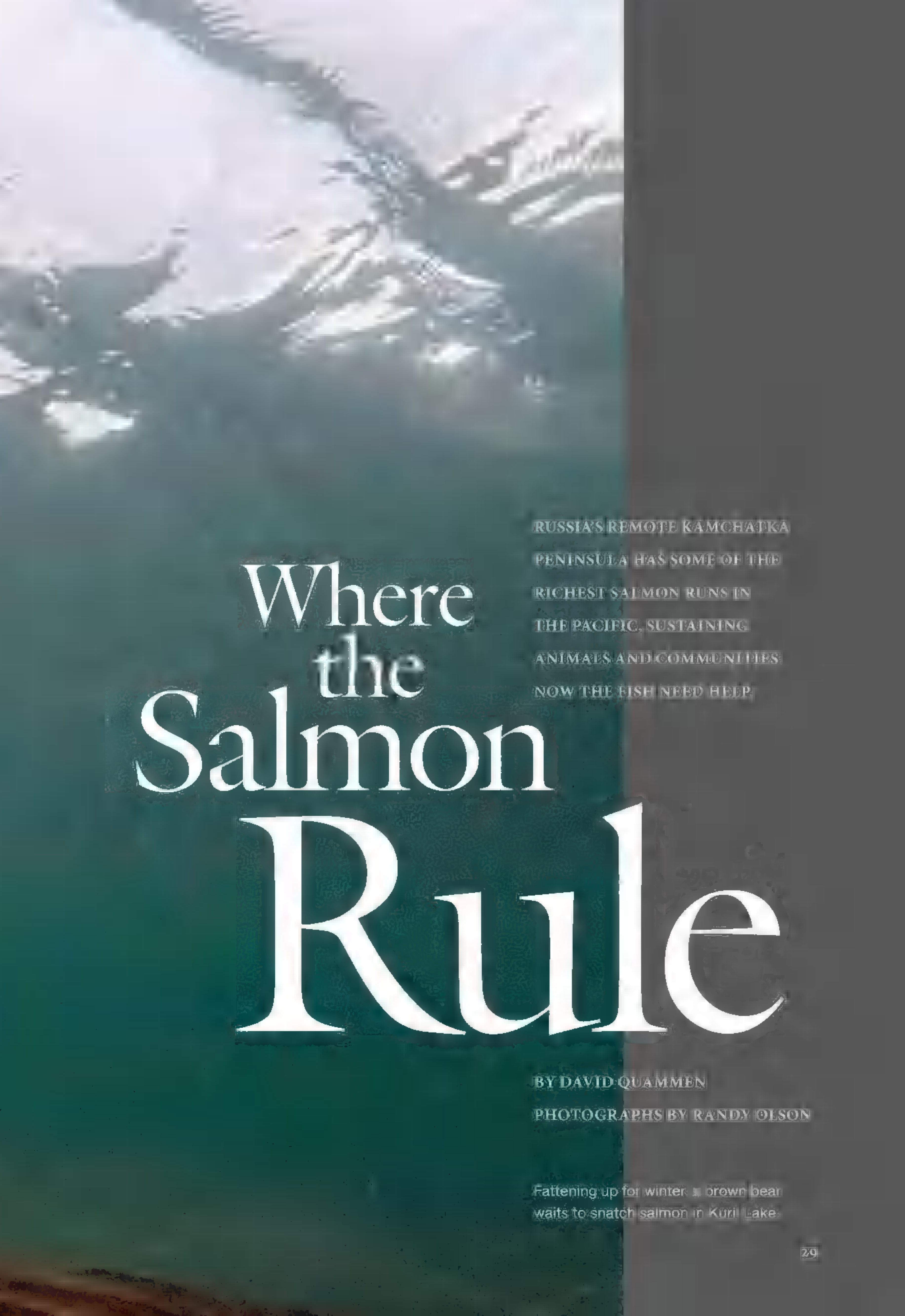
Not so the idea suggested by Roger Angel, an eminent astronomer and telescope designer at the University of Arizona. Angel has proposed launching trillions of two-foot-wide, thinner-than-Kleenex disks of silicon nitride—each disk an autonomous robot weighing less than a gram—into space between Earth and the sun, where they could deflect sunlight. By Angel's own reckoning, the scheme would take decades and cost trillions

of dollars. With that much time and money, we could wean ourselves from fossil fuels and actually solve the climate problem—by far the better outcome, as Angel and most proponents of geoengineering would agree. Unfortunately, though the recession has temporarily slowed the rise in carbon dioxide emissions, we've made no real progress toward that goal. Some say we're running out of time.

If we put up a sunshade without restraining emissions and the sunshade later fails, the climate accident would become a train wreck: The global warming we'd been masking would come rushing at us all at once. That might be the worst unintended consequence of geoengineering, but there could be others—damage to the ozone layer, perhaps, or an increase in drought. If CO₂ keeps rising, though, we may face greater emergencies. And what once seemed insane hubris just might become reality. —Robert Kunzig

➤ **Good or bad idea?** Vote online at ngm.com/bigidea.





Where the Salmon Rule

RUSSIA'S REMOTE KAMCHATKA
PENINSULA HAS SOME OF THE
RICHEST SALMON RUNS IN
THE PACIFIC, SUSTAINING
ANIMALS AND COMMUNITIES
NOW THE FISH NEED HELP

BY DAVID QUAMMEN

PHOTOGRAPHS BY RANDY OLSON

Fattening up for winter, a brown bear
waits to snatch salmon in Kuril Lake.





Six Pacific salmon species migrate back to Kamchatka to spawn, their shapes and colors changing dramatically as they move into fresh water. Sockeye, the most valuable kind, dominates traffic in the Ozernaya River.



Trucker Yuri Krechetov will haul a load of these poho to a nearby processing plant. Females are gutted for their eggs, sold as caviar. Despite quotas on Kamchatka's catch, widespread corruption stymies enforcement.





Some of the planet's last pristine habitat for wild Pacific salmon includes six spawning basins targeted for special protection.

- Protected area
- Proposed for protection
- Salmon hatchery



NGM MAPS
 SOURCES: IHS ENERGY; STATE OF THE SALMON; UNEP AND IUCN

THE KAMCHATKA PENINSULA, rugged and remote, is a vast blade of land stabbing southwestward through cold seas from the mainland of northeastern Russia. Its coastline is scalloped like the edges of an obsidian dagger. Its highlands rise to cone-shaped volcanic peaks, snow-streaked in summer, and to ridges of bare, gray rock. Its gentler slopes are upholstered in boreal greens. It's a wild place, in which brown bears and Steller's sea-eagles thrive on a diet rich in fatty fish. About 350,000 people inhabit Kamchatka Krai (its label as a governmental region), and they too are highly dependent on fish. In fact, you can't begin to understand Kamchatka without considering one extraordinary genus: *Oncorhynchus*, encompassing the six species of Pacific salmon.

Then again, it might also be said: You can't understand the status and prospects of *Oncorhynchus* on Earth without considering Kamchatka, the secret outback where at least 20



Wares for far eastern Russia—like flashy Chinese-made shoes worn by a bridesmaid in the port of Petropavlovsk—arrive chiefly by sea. Outbound ships from Kamchatka carry tons of frozen salmon, bound primarily for China, Japan, and South Korea.

percent of all wild Pacific salmon go to spawn.

Although larger than California, the peninsula has less than 200 miles of paved roads. The capital is Petropavlovsk-Kamchatsky, on the southeastern coast, containing half the total population. Across a nicely protective bay sits the Rybachiy Nuclear Submarine Base, Russia's largest, in support of which the city grew during Soviet times, when the entire peninsula was a closed military region. Travel to most other parts of Kamchatka is still difficult for anyone who doesn't have access to an Mi-8 helicopter. But there is a modest network of gravel roads, and one of those winds upstream along a narrow waterway called the Bystraya River, amid the southern Central Range, to the Malki salmon hatchery, a complex of low buildings surrounded by trees.

Hatchery operations began in Kamchatka in 1914, during the twilight of the tsars, but this facility was established just three decades ago. In a lounge room off the entryway, someone hung

a poster, declaring in Russian: "Kamchatka was created by nature as if for the very reproduction of salmon." That sounds almost like a myth of origins, but the poster listed some nonmythic contributing factors: Permafrost is largely absent, rain is abundant, drainage is good and steady, and because of Kamchatka's isolation from mainland river systems, its streams are relatively depauperate of other freshwater fish, leaving *Oncorhynchus* species to face few competitors and predators. The poster was right. Judged on physical and ecological grounds, it's salmon heaven.

Unfortunately, those aren't the only factors that apply. Kamchatka's tottering post-Soviet economy, fisheries-management decisions (and the politics behind them), and how those decisions are enforced will determine the fate of Kamchatka's salmon runs, driving them toward a future that lies somewhere between two extremes. Within a relatively short time, maybe ten years or twenty, the phrase "Kamchatka



Scene-stealing Koryaksky Volcano looms above Petropavlovsk-Kamchatsky, the regional capital. Here entrepreneurs and bureaucrats execute plans for pipelines, roads, and mines—developments that will build wealth but endanger salmon runs.

salmon” could represent a byword for good resource governance and a green brand, reflecting the greatest success story in the history of fisheries management. Or that phrase could memorialize the saddest and most unnecessarily squandered conservation opportunity of the early 21st century. Think: American alligator. Or think: passenger pigeon. At present, the situation is fluid.

LIFE IS HARD ENOUGH for a salmon, even without politics and economics. Consider the 1.2 million fry released each spring from the Malki hatchery. Roughly five inches long after their first months of growth, they face no easy path from infancy to adulthood. What they face, rather, is a high likelihood of early death. For starters, the hatchery lies about a hundred miles (as a fish swims) from the sea. Each little salmon must descend the Bystraya River to its confluence with a larger river, the Bolshaya. Eluding all manner of freshwater perils on the Bolshaya,

it must gradually metamorphose into a different sort of fish, a smolt, capable of making the transition to life in salt water. From the mouth of the Bolshaya, on Kamchatka’s west coast, it must enter the bigger world of the Sea of Okhotsk, a frigid but nourishing body of water between the peninsula and mainland Russia.

Then, for a period of two to five years (depending on the species), that fish must circulate through the Sea of Okhotsk or else southeastward around the peninsula’s tip into the expanse of the Pacific. The fish might travel thousands of miles, finding its preferred food (mostly small squid and crustaceans) abundant but facing predation, competition, and other challenges of the marine environment. For instance, it might be caught in the open ocean by fishermen using enormous drift nets that trap everything in their path. If it survives these years of robust swimming and feeding, it will grow large, fat, and strong. That’s the advantage of anadromy (a sea-run life history): The ocean years allow

fast growth. Approaching sexual maturity, the fish will head homeward to spawn, using some combination of magnetic sensing and polarized light to find its way back to the Bolshaya River. From the estuary it will ascend upstream by smell, branching into the familiar Bystraya, and finally climbing through the same shallow riffles of the same smaller tributary that its parents ascended before it.

Thousands of eggs will be laid for every two adult fish that return. Unlike an Atlantic salmon or most other species of vertebrate, a Pacific salmon breeds once and then dies. Scientists call the phenomenon semelparity. For the rest of us: big-bang reproduction. After the adult has homed to its spawning stream, death follows sex as inexorably as digestion follows a meal. It's a life-history strategy, shaped by evolution over millions of years, that balances the costs of each spawning journey against the costs of reproductive effort, toward the goal of maximizing reproductive success. In plainer words: Since the likelihood of any fish surviving the whole journey not just once but twice is so slim, Pacific salmon exhaust themselves fatally—they breed themselves to death—at the first opportunity they get. Why hold back anything if you'll never have another chance?

So their lives enact a romantic but pitiless narrative. Their success rate is low, even under optimal circumstances. The miracle of salmon is that any of them manage to complete such an arduous cycle at all. And present circumstances on the Bolshaya River and its tributaries—though the wall poster at Malki didn't say so—are far from optimal.

LUDMILA SAKHAROVSKAYA, director of the Malki hatchery, is a sweet-spirited woman with blond hair and silver glasses who has worked there since the early 1980s. She trained as a biologist in Irkutsk, a warmish city in south-central Siberia, before moving east to this severe outpost in search of a better livelihood. For almost three decades she has watched—she has lived, like a doting nanny—the cycles of salmon rearing, release, and return.

PERESTROIKA, THE COLLAPSE OF
THE STATE, AND ORGIASTIC
PRIVATIZATION DISPOSSESSED THE
NATIVE PEOPLE OF LANDS, WATERS,
AND LIVING RESOURCES.

"Twenty years ago I remember lots of fish coming to this river," she told me, through a translator, on a crisp summer day, as we stood near her fish traps in a little tributary. Those traps were the end point for spawn-ready adults whose eggs and sperm would fuel the hatching and rearing operations of the hatchery. "A variety of species," Sakharovskaya said. "Now I don't see them."

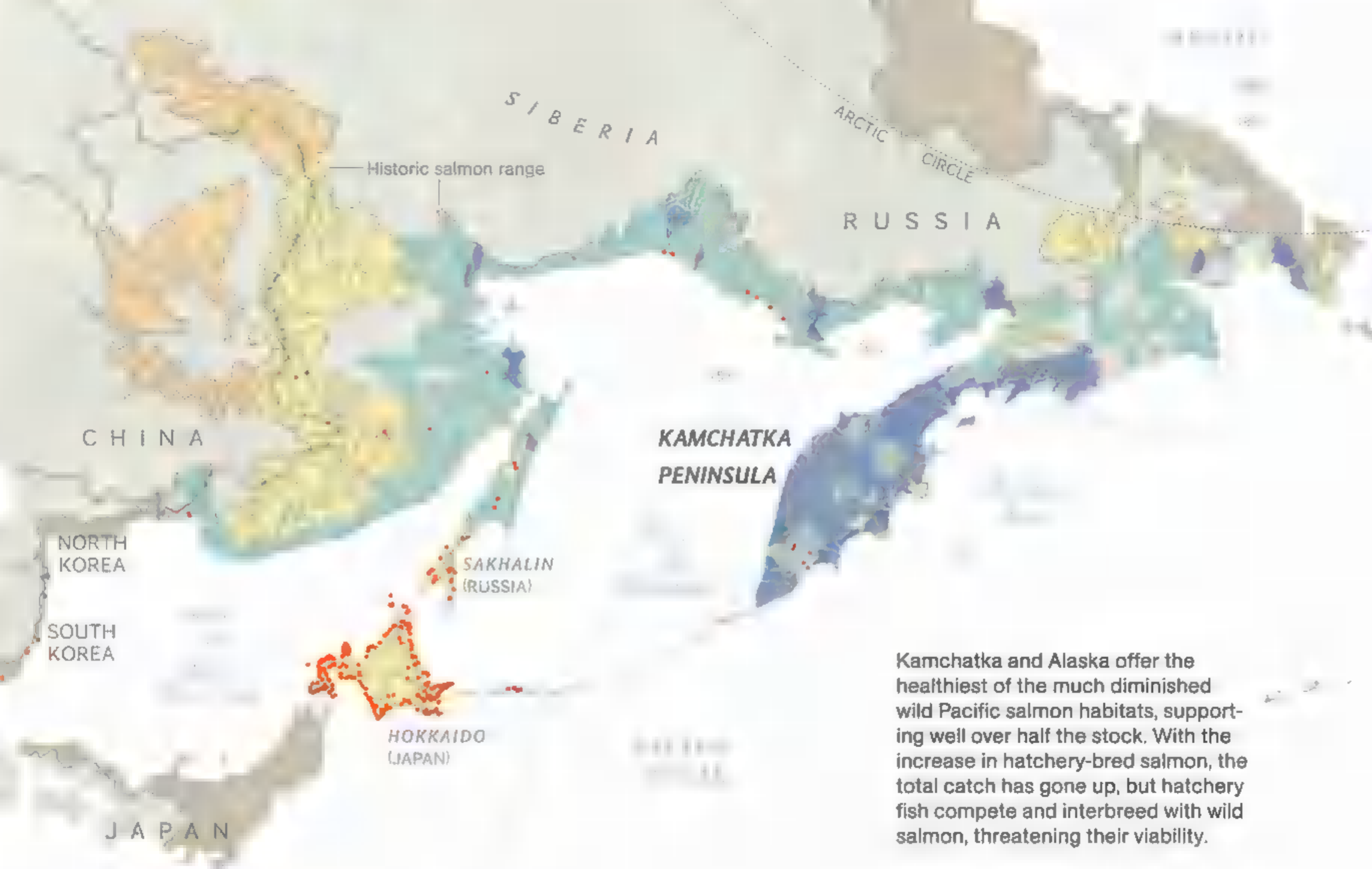
The decline in the run of chinook, *Oncorhynchus tshawytscha*, has been especially severe, she said. These are deep-bodied and silvery creatures with purplish dorsal markings, largest of all salmon species, and therefore sometimes known as king salmon. Once they came in great, regal herds. Nowadays the Malki hatchery releases 850,000 chinook fry (as well as a lesser number of sockeye) annually, but not many adults return. What stops them? Two kinds of illegal harvest: overcatching (*perelov* is the Russian word) by licensed companies that have catch quotas but exceed them with impunity, and poaching by individuals or small crews, mostly for caviar, at concealed spots along the river. The poaching problem throughout Kamchatka is catastrophic in scale, totaling at least 120 million pounds of salmon annually, much of it controlled by criminal syndicates. A hatchery director can't fix that problem, Sakharovskaya noted, and the regulatory authorities evidently don't have the resources or the resolve to do it. So only the luckiest and most elusive of chinook reach their destiny here along the Bystraya. "We can almost count them on fingers," she said.

BUT THE BOLSHAYA DRAINAGE is only one of many river systems on the peninsula, and its hatchery fish aren't representative of Kamchatka

Food is not an abstract concept. It is a source of life and sustenance. The Wymore Food Bank is a vital resource for the community, providing food and nutrition assistance to those in need. We are committed to ensuring that everyone has access to the food they need to thrive. Join us in our mission to feed the community.







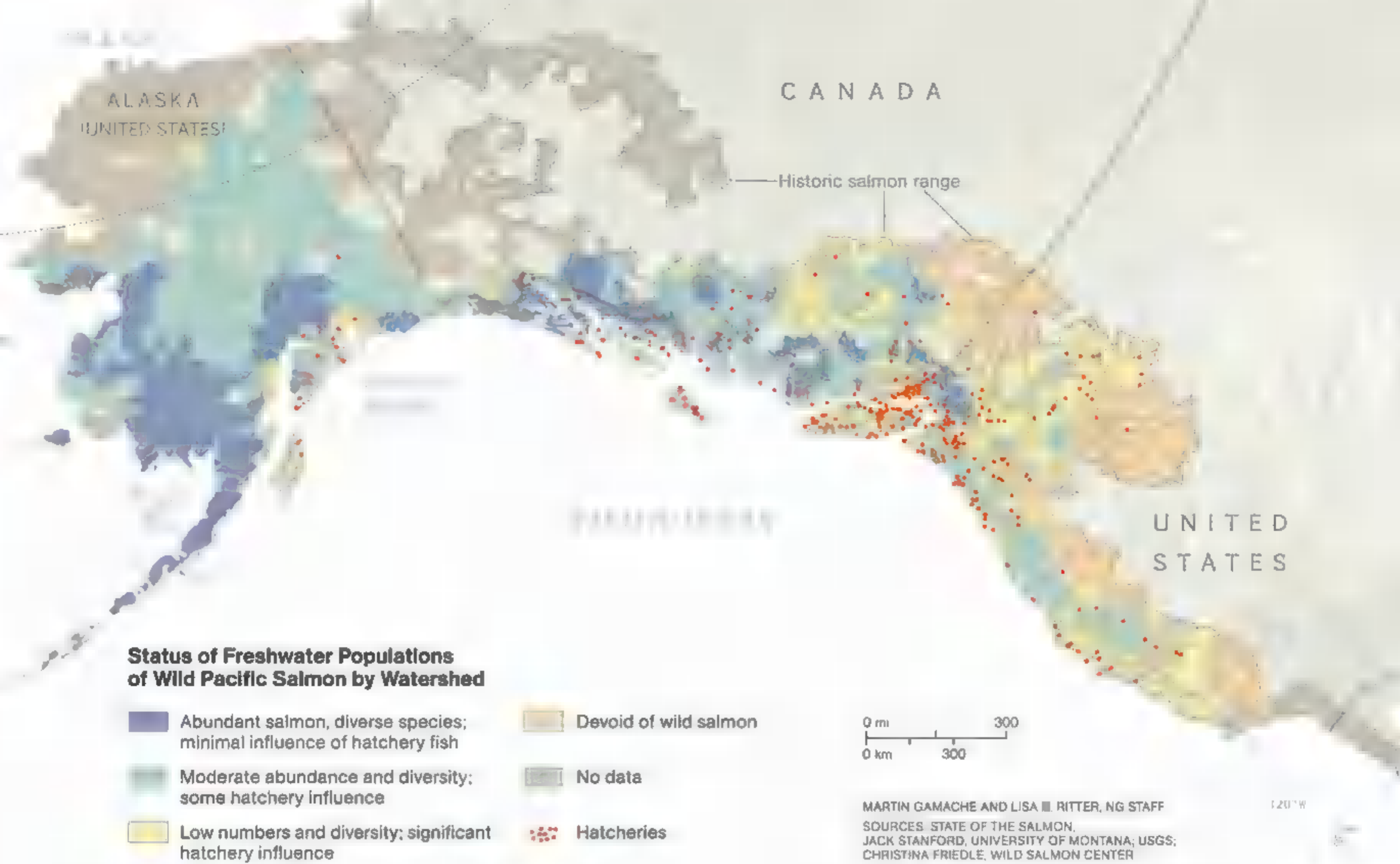
Kamchatka and Alaska offer the healthiest of the much diminished wild Pacific salmon habitats, supporting well over half the stock. With the increase in hatchery-bred salmon, the total catch has gone up, but hatchery fish compete and interbreed with wild salmon, threatening their viability.

wild salmon. Circumstances elsewhere are different; threats, opportunities, regulations, and even bureaucratic structures all change year by year. The whole situation is as complicated as a nested set of *matryoshka* dolls—Putin containing Gorbachev containing Brezhnev containing Stalin. On the Kol River, for instance, which also drains to the west coast, there is no hatchery, no streamside road, and (so far) no tragedy of depleted runs. What the Kol represents is superb habitat, scarcely touched, and abundant runs of wild salmon, including all six species: chinook, sockeye, chum, coho, pink, and masu. Last year, over seven million fish returned to spawn, filling the Kol so fully that in some stretches salmon were packed side to side like paving bricks. The Kol also carries another distinction. By a 2006 decree of the Kamchatka government, that river (along with another nearby stream) became part of the Kol-Kekhta Regional Experimental Salmon Reserve, the world's first whole-basin refuge established for the conservation of Pacific salmon.

On the north bank now sits the Kol River Biostation, a cluster of simple wooden buildings that serves as base for a binational research effort, its field operations led by Kirill Kuzishchin of Moscow State University and his American

colleague, Jack Stanford of the University of Montana. Kuzishchin, Stanford, and their team are studying the dynamics of the Kol ecosystem. They hope to address several big questions, including: How important are salmon to the health of the entire river ecosystem?

Kirill Kuzishchin is a burly man with a linebacker's neck, a sly smile, and a sharp scientific brain. He was raised on a farm near Moscow by his grandparents. At age four he caught his first fish and was evermore fascinated by things piscine; even now, as an associate professor in the ichthyology department at Moscow State, he loves to cast a line when collection of specimens is required. Among the chief lessons of his studies in freshwater ecology is that a river is more than its main channel. "The whole floodplain acts as one single organism," Kuzishchin told me during a late evening talk at the Kol station. Water flows not just downstream but from channel to channel, both on the surface and via the underground aquifer; leaves fall into the river from riparian trees and bushes, supplying food and mineral nutrients to aquatic insects and microbes; whole trees topple into the water, providing cover for fish. "Everything is connected," he said. "The faster the growth of the trees, the more of them falling



down into the river, the more habitats we have.”

But nutrients are continually lost from the upper reaches by the same gravitational pull that takes water, silt, and other material downstream. So why don't these rivers gradually lose productivity? The reason is upstream migration by millions of salmon, Kuzishchin explained. The fish themselves bring nutrients such as nitrogen and phosphorus, accumulated during the years at sea, and surrender those precious loads to the ecosystem as their bodies decay. One aspect of the fieldwork by his and Stanford's team is to gauge the amount of nutrients at the Kol headwaters that are delivered and redelivered by salmon.

The scientists do that by testing for a certain isotope of nitrogen, N-15, which is relatively rare compared with other forms of nitrogen but far more abundant in oceans than in rivers. High concentrations of N-15 in the Kol's water during the season after spawning and decay, and in the leaves of the willow and cottonwood trees lining the banks, reflect the fact that salmon are bringing nutrients upstream. It's a circular effect, Kuzishchin said. Take the salmon away (for instance, by overharvesting or by poaching), and the very leaves of the trees will be deprived of nitrogen. So will

the microbes and insects that eat the leaves. The entire ecosystem will lose nutrients, possibly to the point that it could no longer support large runs of salmon, even if they were reintroduced. He repeated his ecological maxim: “Everything is connected.”

Jack Stanford made the same point more bluntly: “If you harvest all your fish, you cannot have a productive system.”

During a fieldwork excursion upstream from the station, I saw the Kol River's fecundity for myself. We ascended the main channel in motorized johnboats, then proceeded by foot, bashing across the jungly floodplain through a dense thicket of green plants, ten feet high but as delicate as celery, toward a side channel where the team would gather data. Kuzishchin led, chopping a corridor through the vegetation. It was mostly annual growth, consisting of thistle, nettle, cow parsnip, a white-flowered thing called Kamchatka meadowsweet, along with some grasses and ferns, together constituting a fast-growing floodplain assemblage known in Kamchatka as *shelomainik*. Finally we reached the little spring-fed channel, and as Kuzishchin and the others prepared to collect stream insects, algae, tiny fish, depth and flow readings, and willow leaves for nitrogen testing, I asked





P-13-82-YM

Outnumbered and underpaid, inspectors in surplus tanks bog down pursuit of poachers. Researchers say illegal harvests equal or exceed recorded catch, imperiling stocks on many rivers.



Sergei Shurunov, head of ■ crack antipoaching team, muscles up with homemade weights at his camp in South Kamchatka Reserve. Aided by the WWF (World Wildlife Fund), his unit has nearly halted illegal fishing that was once rampant here.

Stanford: What allows all this herby growth to spring up here, within such a short growing season, every year?

“In a word,” he said, “salmon.”

THE SALMON SUPPORT a human ecosystem too. Near the mouth of the Bolshaya in a town called Ust-Bolsheretsk, a local official, Sergei Pasmurov, received me in a sparsely furnished office behind leather-padded doors. Beneath a photo of Vladimir Putin glowering down from behind a fern, Pasmurov offered a candid sketch of local history, which had been difficult recently.

Throughout the Soviet era, Ust-Bolsheretsk was a sizable agricultural center, a base for several large state farms that kept dairy cattle and grew turnips, tomatoes, and other vegetables in hothouses. Fishing was important

also, with two fish-processing plants operating here. Population stood at about 15,000 for the district, including Ukrainians, Belorussians, Irkutsk Siberians—people from all over the U.S.S.R.—as well as indigenous Kamchatkans of the Itelmen ethnic group. Then, so abruptly, so harshly, came the end of the Soviet Union, without which those government-supported agricultural collectives failed. Suddenly there was an unfamiliar phenomenon, unemployment, and the population fell markedly. Dairy production dropped; vegetables became scarce. Pasmurov described the whole cascade of changes concisely and bundled them into one freighted word—*razvalilsya*—that my translator rendered as “the ruining.” Fishing became, for lack of alternatives, the major economic activity of the district.

Fishing is seasonal, also cyclical, with up-and-down fluctuations from year to year. Even during a good year the river can’t support everyone. Nonetheless, about 20 different companies

David Quammen wrote about Kamchatka's wilderness in the January issue. Photojournalist Randy Olson covered the global fisheries crisis in April 2007.

or individuals are currently licensed to fish hereabouts, Pasmurov told me. The number of operators and the quota allotted to each are regulated—but not very stringently—by the Federal Agency of Fisheries. “It results in reducing fish,” he said. Year to year, the runs are becoming smaller. Poaching also plays a role. The Bolshaya is a large river, easily accessible by road, therefore hard to protect. Access will become easier still, he added, now that a pipeline is being built to carry natural gas from the west coast to Petropavlovsk, crossing the Bystraya and a dozen other rivers (including the Kol, notwithstanding its protected-area status). The pipeline itself might be clean and leakproof, Pasmurov said, but the road built alongside it will invite more poaching, especially for caviar.

And caviar—valuable, preservable, portable—is what most poachers are after. “It’s more convenient, easier to hide,” he said. “You just salt it, put it in tanks, hide it in the forest.” Later a truck, or even a helicopter, comes to collect the stash. Netting the salmon as they near their spawning streams, slitting them open, stripping out the eggs, tossing the carcasses aside as waste, a gang of poachers can do huge damage in a very short time. Their wholesale customers might even include some of the big fish-processing plants: laundering caviar for the open market.

I heard the same thing about caviar from other sources, including an ex-poacher on the Kol, who recalled that in the days before protection a small team could harvest five tons in a season. There might be 15 such teams on the river, each man making ten times the money he could in a legal fishing job. Do the arithmetic, and you find that at least 75 metric tons of illegally taken salmon eggs (each mass of eggs accounting for 20 percent of the female’s body weight) amounts to more than three-quarters of a million pounds of illegally killed fish. The carcasses of those salmon are left for bears and other scavengers—a short-term benefit to the ecosystem, yes—but every salmon thus intercepted leaves no offspring to perpetuate the run.

On the lower Bolshaya I saw the business of salmon fishing as practiced legally. It was a

**TAKE THE SALMON AWAY, AND
THE LEAVES OF THE TREES WILL BE
DEPRIVED OF NITROGEN. SO WILL
THE INSECTS. THE ENTIRE
ECOSYSTEM WILL LOSE NUTRIENTS.**

chilly July morning. A dozen men stood ready in waders, wool caps, and rubber gloves as a net was stretched far out across the river’s channel by motorboat, then swung gradually downstream and drawn closed against the same bank, trapping hundreds of sockeye and coho in a watery corral. The men began walking the net back upstream, drawing it tighter toward the shallows, herding salmon onto a gravel beach. The fish, big and silvery (not yet flushed red, as they would be if they reached their spawning grounds), flopped robustly until there was nowhere to go. The men lifted them by their tails, one by one, and tossed them into a cargo boat. When that boat was full, it departed upstream to a landing, for unloading onto a truck, and another took its place. Within half an hour, from one set of the net, the crew took what looked like at least a thousand pounds of fish.

At one point a man lifted a nice-looking fish by the tail and tossed it back into the river. It was a female, heading upstream to spawn, I was told, so they didn’t want to kill it. One fish, at least, might fulfill her reproductive potential. But whether this operation would abide by its legal quota was another issue, impossible for me to judge as a casual observer.

LONG BEFORE THE Russian residents of Kamchatka (who are immigrants and descendants of immigrants) came to depend on salmon fishing as a pillar of the economy, the Itelmen people and other indigenous Kamchatkans had developed cultural, religious, and subsistence practices centered on salmon. The Itelmen, in particular, made their settlements along the banks of rivers, mostly in the southern two-thirds of the peninsula, where they harvested



Found with 450 pounds of illegally harvested salmon roe (below), two suspected poachers (above, at right) from Sobolevo stand by as inspectors burn the caviar, worth nearly \$10,000. Jobs are scarce, so when the salmon run, "virtually every Kamchatka settlement turns into ■ poachers' camp," says a WWF report.



salmon using fish traps and weirs. They dried the pink flesh, they smoked it, they fermented fish heads in barrels. "Those fermented heads had a great deal of vitamins," one Itelmen elder told me. "They cleaned out your stomach and all the bad things in your body." The Itelmen even venerated a god, known as Khantai, whose iconic representation was half fish and half human. In autumn the people set up a tall, wooden Khantai idol facing the river, offered it oblations, then celebrated a harvest festival of thanksgiving for the fish that had come and supplication for more to follow.

A revived form of that ancient festival is held each year in Kovran, on the west coast, which now constitutes the capital of Itelmen life. Kovran villagers still fish by the traditional methods. But starting in the Soviet era, other things changed, threatening Itelmen traditions while bringing little relief to their hard lives.

Irena Kvasova, an Itelmen activist I met at a small office in a backstreet of Petropavlovsk, told me that Soviet policy had required country people, including her mother, to abandon their remote hamlets and aggregate in centers such as Kovran. There they became laborers on collective farms or fishing collectives, a very different existence for people accustomed to independence and living off the land. The Itelmen received tax exemptions, true, and the government bought the ferns and berries they gathered and the game they hunted, at fair prices.

But during the more fevered decades of Stalinism, Soviet authorities felt a need to find "enemies of the state." People anonymously denounced their neighbors, sometimes just to settle a grudge. Kvasova's own great-grandfather had been one victim. A proud Itelmen, a hunter and fisherman, leader of the collective council, he was targeted in a poison letter, arrested, and sent to the camps beyond Magadan—that is, the Kolyma River region, grimmest of all islands in the Gulag Archipelago—where he died. In the aftermath, her family stopped communicating, even with one another, so as to avoid attracting suspicion.

In the 1970s, as the Soviet regime became

NETTING THE SALMON, SLITTING
THEM OPEN, STRIPPING OUT THE EGGS,
TOSSING THE CARCASSES ASIDE,
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relatively less sinister but more stolidly bureaucratic, outsiders, arriving from the south, received positions and enjoyed benefits while the Itelmen people were marginalized in their own communities. Gorbachev's perestroika, followed by the collapse of the state, followed by orgiastic privatization, completed the process of dispossessing the native people of lands, waters, and living resources they had husbanded for millennia.

One sign of that progressive dispossession is that the Itelmen must compete with commercial Russian fishing companies for limited salmon-fishing quotas. The Itelmen number only about 3,500 people, one percent of Kamchatka's total. Power resides in Petropavlovsk, not in Kovran, and power influences the granting of quotas and fishing sites from river to river. The bureaucrats who grant those quotas and sites on the Kovran River have been generous to outsider-owned commercial companies, an Itelmen leader named Oleg Zaporotsky told me, while restricting the local people to quotas that are marginal, even for subsistence. The companies employ a few Itelmen, but generally not in the better-paying jobs. And beyond the issue of subsistence fishing, Zaporotsky explained, some Itelmen want to establish their own fishing-and-processing cooperatives, which would bring income to the community, support schools and other institutions, and provide good jobs that would keep people from drifting away.

Zaporotsky himself has partnered with others to buy a diesel generator for freezing fish, the first step toward claiming a market share. "If we don't create some small enterprises," he told me, "these settlements" (Continued on page 54)



How remote is the village of Koryak? It is reached by a 1.2-hour dog to the nearest accessible town. Yana is a small helicopter arrival, a motorbike bus, a few of the 100 residents, most of them indigenous Koryak people, for the nearby landing camp, where they hope to catch a boat.





Love and Caviar



Кремльдің медициналық жәрдемшісінің қызының үйі. Кремльдің әйелдерінің көпшілігі Кремльден тыс жерлерде тұрады, бірақ Кремльдің медициналық жәрдемшісінің қызының үйі Кремльдің медициналық жәрдемшісінің қызының үйі. Кремльдің әйелдерінің көпшілігі Кремльден тыс жерлерде тұрады, бірақ Кремльдің медициналық жәрдемшісінің қызының үйі Кремльдің медициналық жәрдемшісінің қызының үйі.





The nearly empty road winds through the village to bring food supplies to people that need to work to afford the business. Missing a market and here, a lack of proper infrastructure plan, money is limited, giving freedom to those who can afford it.

THE PHRASE “KAMCHATKA SALMON”
COULD REPRESENT THE GREATEST
SUCCESS STORY IN FISHERIES
MANAGEMENT—OR MEMORIALIZE
A SQUANDERED OPPORTUNITY.

won't survive.” So far the bureaucrats have refused to grant commercial-scale quotas to Zaporotsky's local group or any other.

ON THE OPPOSITE SIDE of the Pacific, the wild salmon runs of North America (south of Alaska), once great, have been devastated—and in some cases obliterated—by dambuilding, dewatering for irrigation, overfishing, agricultural pollution, and other forms of habitat degradation, and they've been genetically diminished by reliance on hatcheries. The people of Kamchatka have a chance to be wise and provident where Americans and Canadians have been stupid and careless. For Kamchatka to become the world's foremost wild salmon refuge, the runs in its rivers don't need to be restored; they need only to be protected from poaching, overcatching, oil and gas spills, disruptive and poisonous mining, and other forms of shortsighted mistake. The region could also become one of the richest export producers of fresh salmon, frozen salmon, and caviar. Those two prospects aren't incompatible; they're interlocked.

This is why the Wild Fishes and Biodiversity Foundation (WFBF), of Kamchatka, and its American partner, the Wild Salmon Center (WSC), supplied help and encouragement when the Kamchatka government created the Kol-Kekhta Regional Experimental Salmon Reserve, and why they support current efforts toward designating another protected area for salmon, on the Utkholok River up north. WFBF and WSC have also backed an ambitious vision of adding five more such protected areas—on the Oblukovina, Krutogorova, Kolkpakova, and Opala Rivers (all draining to the west coast), and the Zhupanova River (draining

east), each to encompass not just the river itself but its full drainage basin, including the headwater streams in which the salmon spawn and all the terrestrial habitat. Those five areas, together with the Kol and the Utkholok, would make Kamchatka the planet's greatest, boldest experiment in nurturing wild salmon species for their own sakes and for the measured use of humankind. And it could actually happen—if long-term management perspectives informed by scientific research, along with honest governance backed by strict enforcement, are allowed to triumph over the scramble for short-term gain by insiders.

Of course, some people prefer the old way, whether that represents Soviet-flavored enterprises (the V. I. Lenin Fishing Collective still operates from a large building near the Petropavlovsk waterfront) or heedless private resource extraction in the spirit of Standard Oil, Anaconda (copper), and Peabody (coal). History and human need lie heavily on Kamchatka. A huge bronze statue of Lenin himself, thick-limbed and implacable, still stands in the plaza outside the main government offices. Moscow still sets the course. People without jobs still need to eat, and fish are there for the taking.

It's a long journey from idealistic plans to concrete, well-enforced protections, just as it's a long journey from the deep Pacific to the gravelly shallows of the Bystraya River. I can't forget what Ludmila Sakharovskaya said as we stood streamside at the Malki hatchery. Twenty-five years of hatching and nurturing fish, releasing them, seeing ever fewer return, had made her cynical. She was tired too, eager to take her pension and go to Irkutsk. Yes, we have reforms now, she said—or anyway, there's talk of reforms. But that's just talk, just formalities. Poaching is easy to do and hard to prevent. She knows of whole settlements, in the mountains, filled with people who could seek a legal job but don't, who live out the winter waiting for summer, when they can poach salmon.


Were things better during the Soviet era?

She considers that for a second or two, and answers carefully: “Better for fish.” □



Bear eats salmon, a fundamental drama in Kamchatka's still largely intact ecosystem. So many salmon—pink, chum, sockeye (above), coho, chinook, and masu—flood the waters that typically solitary brown bears crowd together to feed at Kuril Lake (below). This lake and other watersheds are protected. Conservationists urge adding more reserves to preserve a paradise for salmon.



An aerial photograph of a volcanic landscape. A large, dark, conical volcano dominates the right side of the frame, with a massive, billowing plume of white ash and smoke rising from its summit. The plume extends across the sky towards the left. The foreground and middle ground show a rugged, rocky terrain with patches of green vegetation and brown earth. The overall scene is dramatic and powerful, capturing the scale of a supervolcanic eruption.

Fire and debris spew from Yellowstone in an artist's depiction of a supervolcanic eruption. It's unlikely the next major blast will occur in our lifetimes, but scientists have their ears to the ground.

Beneath Yellowstone Park a monstrous plume of hot rock is causing the earth to heave and tremble. Past volcanoes have erupted with a thousand times the power of Mount St. Helens. The future is anybody's guess.

When Yellowstone



Explodes

Snowmelt and rainwater, superheated hundreds of feet below the surface, blast from Sawmill Geyser in a geothermal belch as high as 20 feet. Hardened remains of old lava flows cover much of the area.





By Joel Achenbach

Photographs by Mark Thiessen

Art by Hernán Cañellas

**On August 29,
1870, a 30-year-old
Army lieutenant
named Gustavus**

Doane, part of an exploratory expedition in the Yellowstone region in the territory of Wyoming, scrambled his way to the summit of Mount Washburn above the Yellowstone River. Looking to the south, he noticed that something was missing from a stretch of the Rocky Mountains: mountains. For miles and miles, the only elevations were in the distance, forming parentheses around a huge forested basin. Doane saw only one way to explain the void. “The great basin,” he wrote, “has been formerly one vast crater of a now extinct volcano.”

The lieutenant was right: Yellowstone is a volcano, and not just any volcano. The oldest, most famous national park in the United States sits squarely atop one of the biggest volcanoes on Earth. Doane was wrong, however, in one crucial respect. Yellowstone’s volcano is not extinct. To an unsettling degree, it is very much alive.

THERE ARE VOLCANOES, and then there are supervolcanoes. The latter have no agreed-on definition—the term was popularized in a BBC documentary in 2000—but some scientists use it to describe explosions of exceptional violence and volume. The U.S. Geological Survey applies the term to any eruption ejecting more than 1,000 cubic kilometers (240 cubic miles) of



pumice and ash in a single event—more than 50 times the size of the infamous Krakatau eruption of 1883, which killed more than 36,000 people. Volcanoes form mountains; supervolcanoes erase them. Volcanoes kill plants and animals for miles around; supervolcanoes threaten whole species with extinction by changing the climate across the entire planet.

No supervolcano has erupted in recorded human history, but geologists have pieced together what an explosion must have been like. First, a plume of heat wells up from deep within the planet and melts rock just beneath the crust of the Earth, creating a vast chamber filled with a pressurized mix of magma, semisolid rock, and dissolved water vapor, carbon dioxide, and other gases. As additional magma accumulates in the chamber over thousands of years, the land above begins to dome upward by inches. Fractures open along the dome's edges, as if burglars were sawing a hole from beneath a wooden floor. When the pressure in the magma chamber is released through the fractures, the dissolved gases suddenly explode in a massive, runaway reaction. It's like "opening the Coke bottle

Joel Achenbach is a Washington Post staff writer and a frequent contributor to National Geographic. Mark Thiessen is a Geographic staff photographer. Artist Hernán Cañellas lives in Buenos Aires.

after you've shaken it," says Bob Christiansen, a U.S. Geological Survey scientist who pioneered research on the Yellowstone volcano in the 1960s. With the magma chamber emptied, the surface collapses. The entire domed region simply falls into the planet, as though the Earth were consuming itself. Left behind is a giant caldera, from the Spanish word for "cauldron."

The "hot spot" responsible for the Yellowstone caldera has erupted dozens of times in the past, going back some 18 million years. Since the hot spot is rooted deep in the Earth, and the tectonic plate above it is moving southwest, ghostly calderas from the more ancient explosions are strung out like a series of gigantic beads across southern Idaho and into Oregon and Nevada, the subsequent lava flows forming the eerie moonscapes of the Snake River Plain.

The last three super-eruptions have been in Yellowstone itself. The most recent, 640,000 years ago, was a thousand times the size of the Mount St. Helens eruption in 1980, which killed 57 people in Washington. But numbers do not capture the full scope of the mayhem. Scientists calculate that the pillar of ash from the Yellowstone explosion rose some 100,000 feet, leaving a layer of debris across the West all the way to the Gulf of Mexico. Pyroclastic flows—dense, lethal fogs of ash, rocks, and gas, superheated to 1,470 degrees Fahrenheit—rolled across the landscape in towering gray clouds. The clouds filled entire valleys with hundreds of feet of material so hot and heavy that it welded itself like asphalt across the once verdant landscape. And this wasn't even Yellowstone's most violent moment. An eruption 2.1 million years ago was more than twice as strong, leaving a hole in the ground the size of Rhode Island. In between, 1.3 million years ago, was a smaller but still devastating eruption.

Each time, the whole planet would have felt the effects. Gases rising high into the stratosphere would have mixed with water vapor to create a thin haze of sulfate aerosols that dimmed sunlight, potentially plunging the Earth into years of "volcanic winter." According to some researchers, the DNA of our own species

may pay witness to such a catastrophe around 74,000 years ago, when a supervolcano called Toba erupted in Indonesia. The ensuing volcanic winter may have contributed to a period of global cooling that reduced the entire human population to a few thousand individuals—a close shave for the human race.

FOR ALL THEIR VIOLENCE, the supervolcanoes have left little behind beyond a faintly perceptible sense of absence. The Yellowstone caldera has been eroded, filled in with lava flows and ash from smaller eruptions (the most recent was 70,000 years ago) and smoothed by glaciers. Peaceful forests cover any lingering scars. The combined effect makes it almost impossible to detect, unless you've got a good eye, like Doane had, or a geologist whispering in your ear.

"You're seeing two-thirds of the entire caldera," says Bob Smith. "The size is so immense that people don't appreciate it." Smith is a University of Utah geophysicist and a prominent expert on the supervolcano at Yellowstone. We're standing atop Lake Butte, an overlook at the east end of Yellowstone Lake, one of the best places to see the caldera. But I don't see it. I can see the lake spread out for miles beneath us and a few little hills to the north—old lava domes. But I can't follow the caldera rim visually because much of it is beneath the lake and because of the sheer scale of the thing—roughly 45 miles across. Like Doane atop Mount Washburn, I see only distant mountains on the horizon on either side and between them, to the west, the "unmountains," the emptiness where the land swallowed itself in the course of a few days.

The effects of the past eruptions are nevertheless profoundly felt in the present. The lodgepole pines that dominate the park's forests are adapted to growing in nutrient-poor soils, like those in the Yellowstone caldera. So too are the whitebark pines, whose nuts sustain grizzlies and black bears.

And of course, the land to this day

is literally boiling over. The trout that riot in the rivers would not be so abundant without the warming effects of the hydrothermal springs at the bottom of frigid Yellowstone Lake. The park roils with geysers, fumaroles, mud volcanoes, and other hydrothermal activity. Half the geysers on the planet are in Yellowstone. The hydrothermal features change constantly in temperature and behavior, with new ones popping up in the forests, spewing clouds of steam visible from airplanes, exuding vapors that have been known to kill bison on the spot.

In spite of this "most violent gaseous ebullition," as one early explorer put it, the volcano beneath Yellowstone was long thought to be extinct, as Doane believed, or at least in its dying days. Indeed, after federal surveys in the late 19th century, the volcanic nature of Yellowstone received little scientific scrutiny for decades. Then in the late 1950s, a young Harvard graduate student, Francis "Joe" Boyd, became intrigued by the presence of a welded tuff—a thick layer of heated and compacted ash, which he realized was a sign of pyroclastic flows from an explosive, geologically recent eruption.

In 1965 Bob Christiansen found a second distinct welded tuff; the next year he and his colleagues identified a third. Using potassium-

argon dating, they determined that the three tuffs were the result of three distinct eruptions. Each created a giant caldera, with the most recent eruption largely burying signs of the previous two.

Then one day in 1973, Bob Smith and a colleague were doing some work on Peale Island, in the South Arm of Yellowstone Lake, when Smith noticed something odd: Some trees along the shoreline were partially submerged and dying. He had worked in the area back in 1956 and

If the magma rises quickly, the gases can't escape fast enough. It's like opening a Coke bottle after you've shaken it.

Sleeping Giant

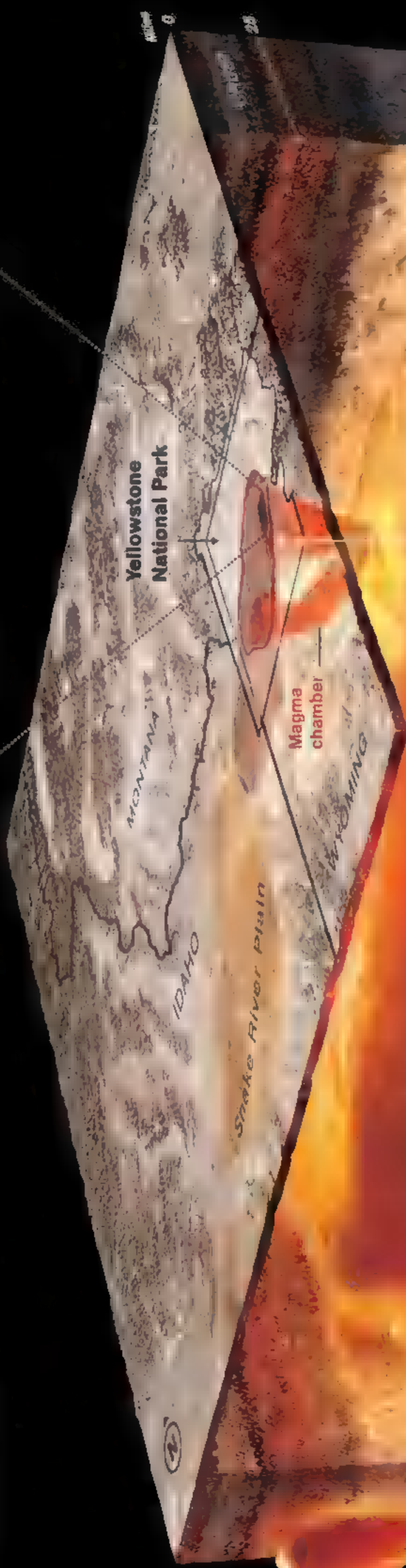
Below Yellowstone, a hellish column of super-heated rock—mostly solid, some viscous, some molten—rises from hundreds of miles within the Earth. Current stirrings may be remnants of a past eruption, or early harbingers of a still far-distant cataclysm.

AREA ENLARGED

Earthquake Swarm

Just 11 days starting last December, 1,000 quakes hit an area that averages 2,000 a year.

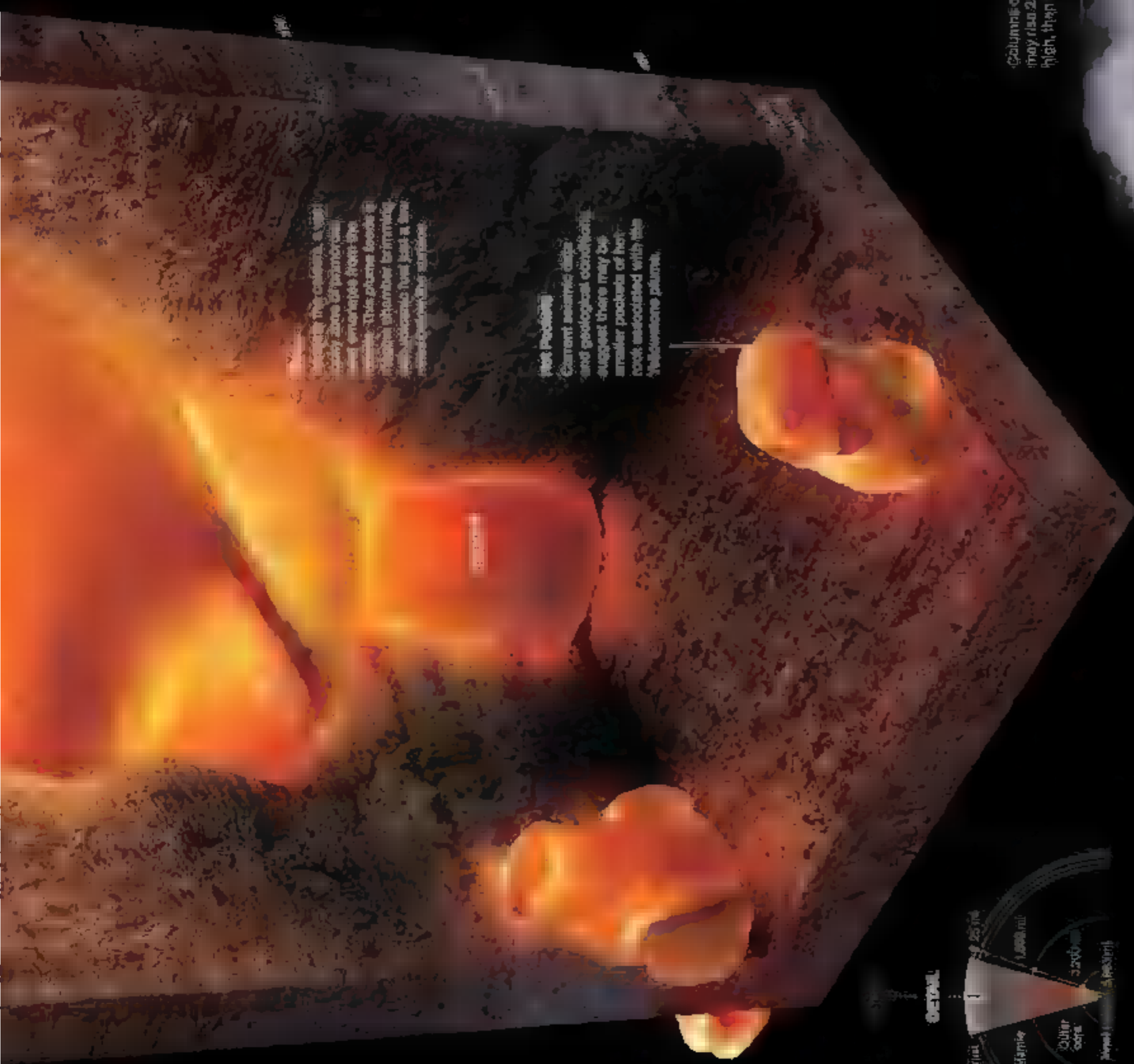
- 3+ Perceptible
 - 0-3 Imperceptible
- Magnitude



0 25 50 Miles

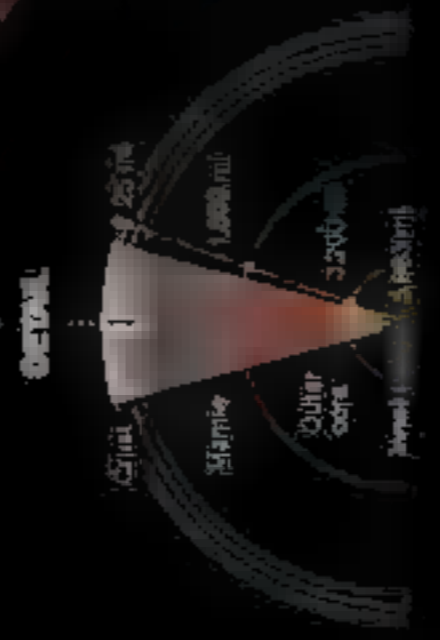
Buoyed by an expanding magma chamber, the caldera formed during a major eruption has risen as much as inches a year over the decade.

2500°F



...the magma chamber. As the magma rises, it can become more viscous and more explosive. This process is called degassing. The process of degassing is what causes the formation of gas bubbles in the magma. As the magma rises, the gas bubbles expand and eventually escape from the magma. This process is called degassing. The process of degassing is what causes the formation of gas bubbles in the magma. As the magma rises, the gas bubbles expand and eventually escape from the magma. This process is called degassing.

Hot Pockets
Current seismic data and geological observations suggest there may be smaller pockets of hot rock associated with the Yellowstone plume.



Columns of ash may rise 25 miles high, then fall.

What Happens the Next Time?

Scientists can anticipate the stages of a super-eruption (below). Widespread ecological devastation would follow, and consequences would be felt for years.



Before Eruption
The magma chamber is full, and the volcano is quiet. The forest is healthy.



The Earth Freckles
Gas-filled magma explodes upward, with loud blasts that rain down across hundreds of miles. Heavy ash flows clog rivers, and carpet landscapes near and far.

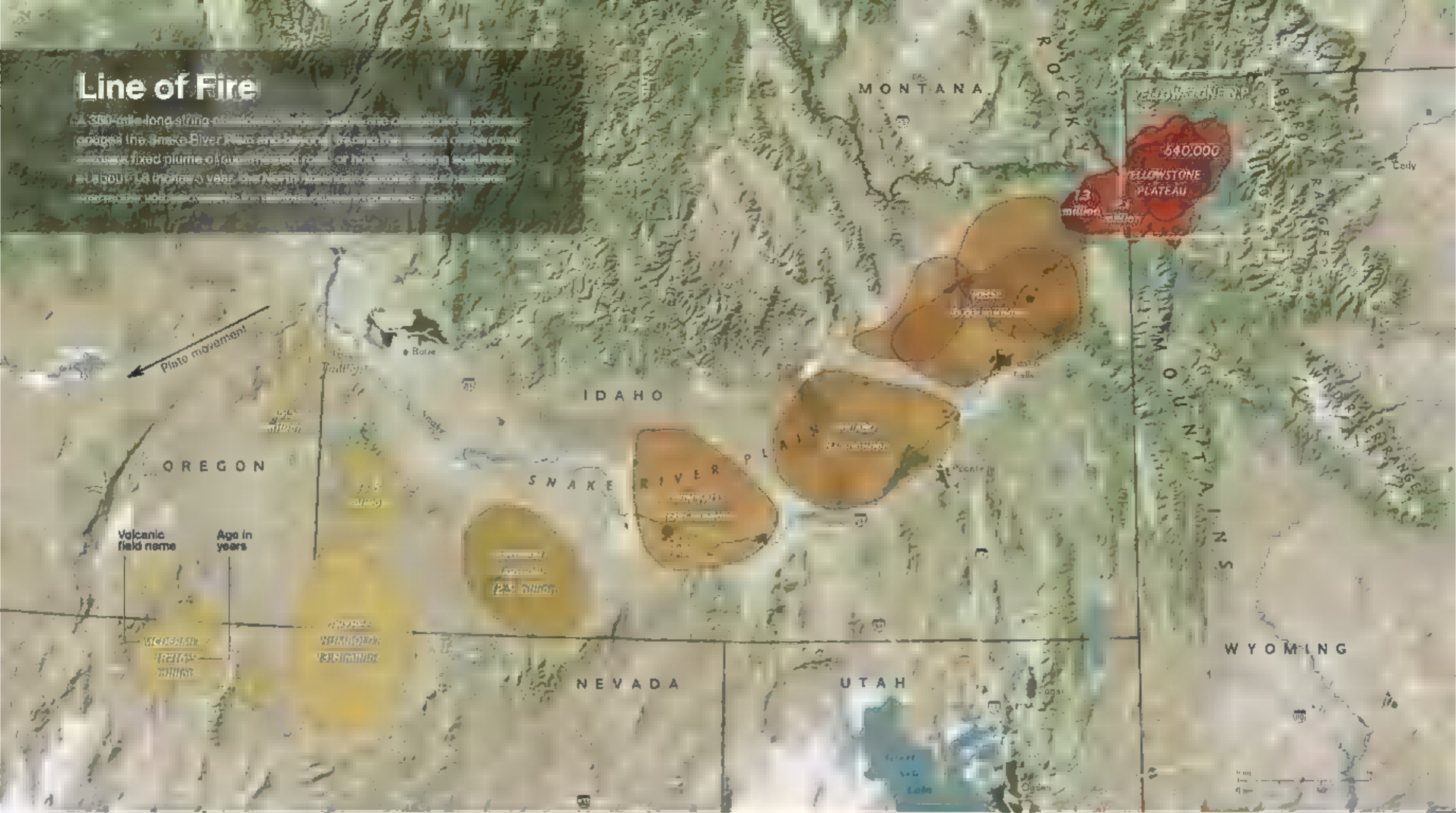


Breathless Caldera
The magma chamber goes on for 100 years in this way, with ash and cooling acid rain. Eventually, the land collapses and a new caldera is born.

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Line of Fire

A 300-mile-long string of volcanoes along the Snake River Plateau and the Yellowstone Plateau has fixed a plume of air, magma, and rock for hot spots that erupt about 18 times a year. The North American Plateau is moving westward at 1.5 cm per year.



18 to 13.8 million years ago

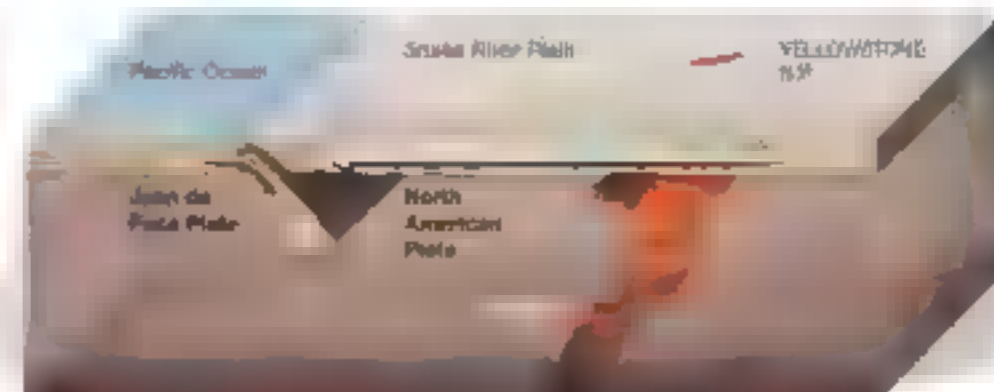
As the edge of one tectonic plate grinds under another, the plume breaks through, causing eruptions that form vast calderas on the surface.

12.5 to 6.85 million years ago

Plate drift continues, with new blasts occurring northeast of earlier sites. Ashfall causes massive wildlife die-offs hundreds of miles away.

2.1 million years ago to today

The plume drives three huge eruptions, then settles into a calmer phase, powering Yellowstone's geysers, mud pots, and hot springs.



The Yellowstone Eruptions

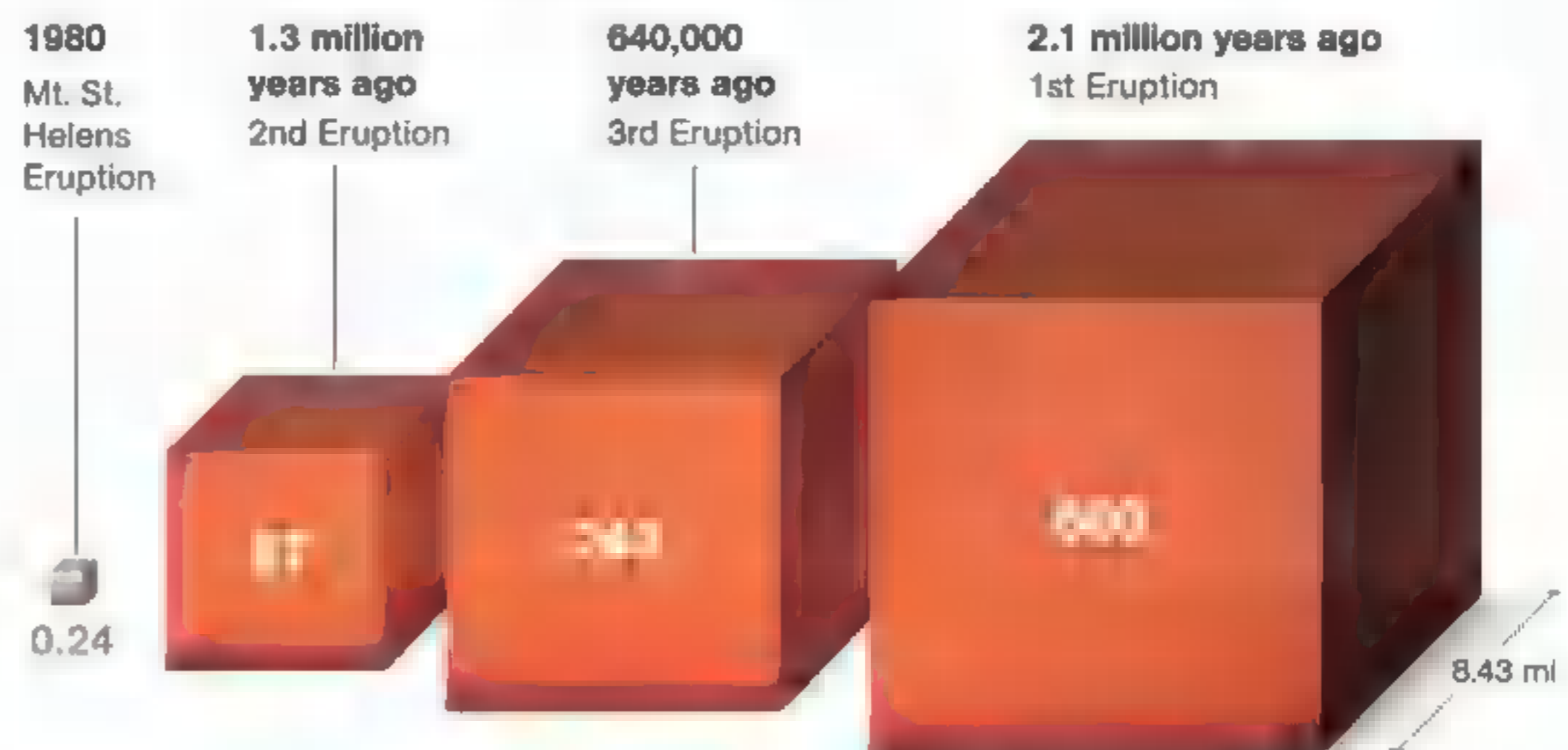
Three major blasts, bigger than most known prehistoric eruptions, have shaken the Yellowstone National Park area in its two million years atop the plume.

How Big?

Monumental. The combined material from the three events would fill the Grand Canyon. The largest ejected enough rock, lava, and ash to bury an area the size of California under more than 20 feet of debris. Even the smallest was 280 times more voluminous than the 1980 eruption of Mount St. Helens.

Comparative Volume of Eruptions

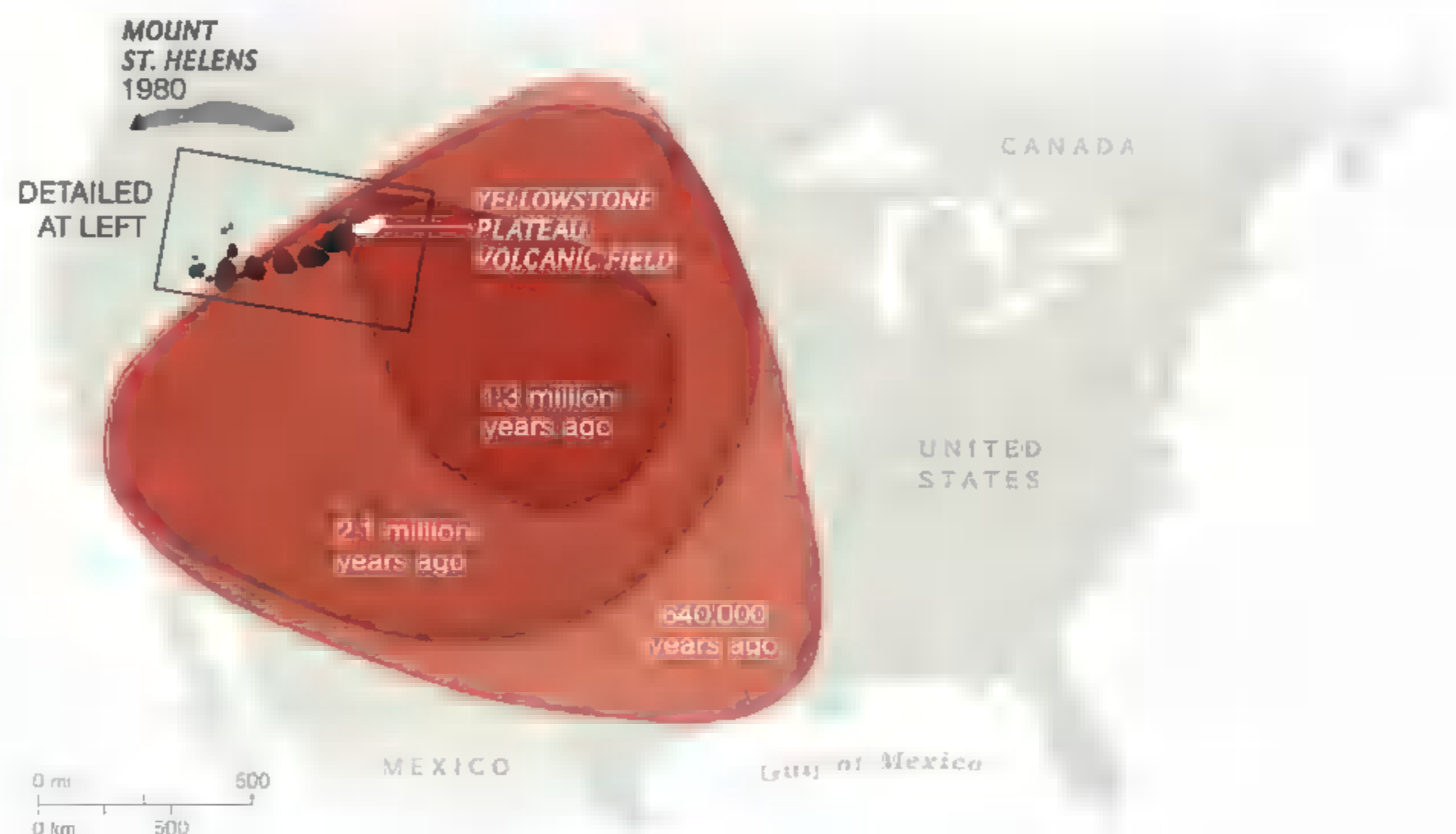
In cubic miles



How Far?

Some events spread ash thousands of miles. After the biggest eruption, wind carried dust around the globe, and ash piled up in drifts across the western half of the U.S. Near the caldera, lava and debris hardened into layers hundreds of feet thick. For years pollutants chilled the climate, devastating ecosystems.

Ash Coverage



ALEJANDRO TUMAS, NG STAFF; SHELLEY SPERRY; NGM MAPS
 SOURCES: ATLAS OF YELLOWSTONE, UNIVERSITY OF OREGON AND YELLOWSTONE NATIONAL PARK (MAIN MAP); ROBERT L. CHRISTIANSEN AND KENNETH L. PIERCE, USGS

was planning to use the same boat dock as on the earlier trip. But the dock was also inundated. What was going on?

Intrigued, Smith set out to resurvey benchmarks that park workers had placed on various roads throughout the park beginning in 1923. His survey revealed that the Hayden Valley, which sits atop the caldera to the north of the lake, had risen by some 30 inches over the intervening decades. But the lower end of the lake hadn't risen at all. In effect, the north end of the lake had risen and tipped water down into the southern end. The ground was doming. The volcano was alive.

Smith published his results in 1979, referring in interviews to Yellowstone as "the living, breathing caldera." Then in 1985, heralded by a "swarm" of mostly tiny earthquakes, the terrain subsided again. Smith modified his metaphor: Yellowstone was now the "living, breathing, shaking caldera."

In the years since, Smith and his colleagues have used every trick they can devise to "see" beneath the park. Gradually, the proportions and potential of the subterranean volcanic system have emerged. At the shallowest level, surface water percolates several miles into the crust, is heated, and boils back up, supplying the geysers and fumaroles.

About five to seven miles deep is the top of the magma chamber, a reservoir of partially melted rock roughly 30 miles wide. Basaltic magma is trapped inside the chamber by denser, overlying rhyolitic magma, which floats on top of the liquid basalt like cream on milk. By looking at the way sound waves created by earthquakes propagate through subsurface rock of varying densities, the scientists have discovered that the magma chamber

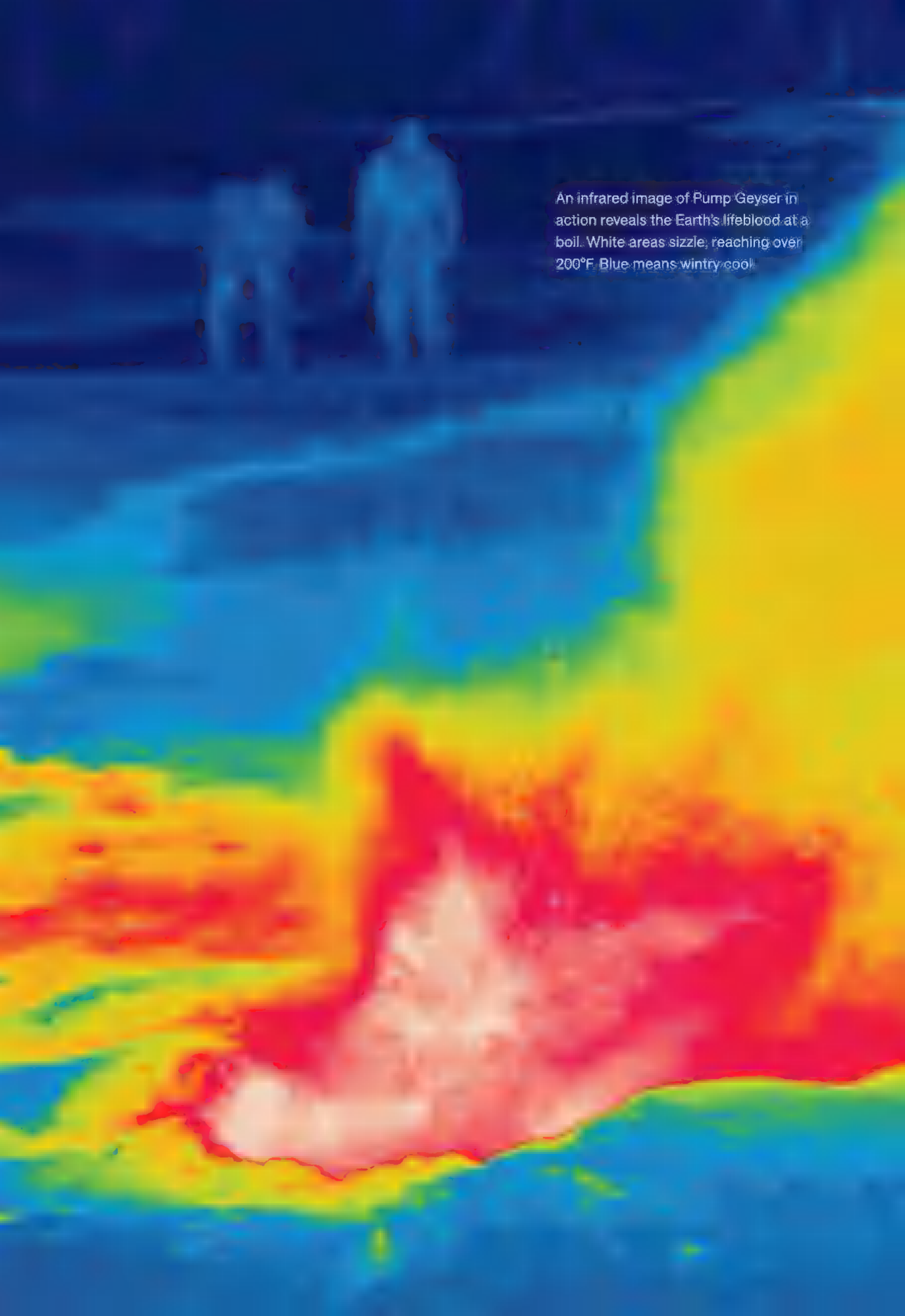
Hayden Valley, at the north end of the lake, had risen some 30 inches. The ground was doming. The volcano was alive.

is fed by a gigantic plume of hot rock, rising from the Earth's upper mantle, tilted downward to the northwest by 60 degrees, its base perhaps 400 miles below the surface. When the plume pumps more heat into the chamber, the land heaves upward. Small earthquakes allow hydrothermal fluids to escape to the surface, easing the pressure inside the chamber, which causes the ground to subside again. After the 1985 earthquake swarm, Yellowstone fell eight inches over the course of a decade or so. Then it rose again, faster this time. Since 2004, portions of the caldera have surged upward at a rate of nearly three inches a year, much faster than any uplift since close observations began in the 1970s. The surface continues to rise despite an 11-day earthquake swarm that began late in 2008, causing a flurry of apocalyptic rumors on the Internet.

"We call this a caldera at unrest," Smith says. "The net effect over many cycles is to finally get enough magma to erupt. And we don't know what those cycles are."

So, the colossal question: Is it going to blow again? Some kind of eruption—perhaps a modest one like Mount Pinatubo's in the Philippines, which killed 800 people in 1991—is highly likely at some point. The odds of a full, caldera-forming eruption—a cataclysm that could kill untold thousands of people and plunge the Earth into a volcanic winter—are anyone's guess; it could happen in our lifetimes, or 100,000 years or more from now, or perhaps never. Bob Christiansen, now retired, suspects the supervolcano may be safely bottled up. For most of its history, the Yellowstone hot spot has formed calderas in the thin crust of the Basin and Range area of the American West. Now the hot spot is lodged beneath a much thicker crust at the crest of the Rockies.

"I think that the system has more or less equilibrated itself," says Christiansen. Then he quickly adds, "But that's an interpretation that would not stand up in court." □



An infrared image of Pump Geyser in action reveals the Earth's lifeblood at a boil. White areas sizzle, reaching over 200°F. Blue means wintry cool.



THE ART OF DECEPTION

SOMETIMES SURVIVAL MEANS
LYING, STEALING, OR
VANISHING IN PLACE.

Three leaf-litter lizards collected within yards of each other almost disappear on a forest floor in Panama. Staying alive in the tropics, where nearly everything is food for something else, often calls for such tactics to fool a predator's eye.

PHOTOS BY MARGARET PEVA







CREATE A DIVERSION A bird zeroing in on a flag-footed bull perched on a passionflower might see the flutter of red “flags”—the insect’s attempt to divert the hunter’s bite to nonessential limbs, away from its vital core.

ANISOCELIS FLAVOLINEATA (INSECT); *PASSIFLORA* SP. (FLOWER)

BY NATALIE ANGIER

PHOTOGRAPHS BY CHRISTIAN ZIEGLER

When Macbeth was told he had nothing to fear until the local woods started ambling up to his castle, the tyrant sighed with relief, for “who can impress the forest, bid the tree unfix his earth-bound root?”

Macbeth obviously had never been to Barro Colorado Island in Panama.

It is 9 p.m. and as dark as a witch’s mummy, but in the cone of light cast by my headlamp, parts of trees seem to be unfixing themselves and wandering at will. A four-inch twig buzzes overhead and thuds onto a nearby branch. A lime green leaf scratches through a pile of brown leaves, finds nothing of interest, and crawls toward another pile.

I approach the migrants for a closer look, knowing full well what they are but still dazzled by the details, by the almost comical earnestness of the charade they embody. The “twig” is a stick insect, a magnificent specimen of the Phasmatodea clan, its outer sheath a persuasive rendering of striated bark, its tubular body and head punctuated by fake axillary buds and leaf scars—the little knobs and notches that make a twig look twiggy.

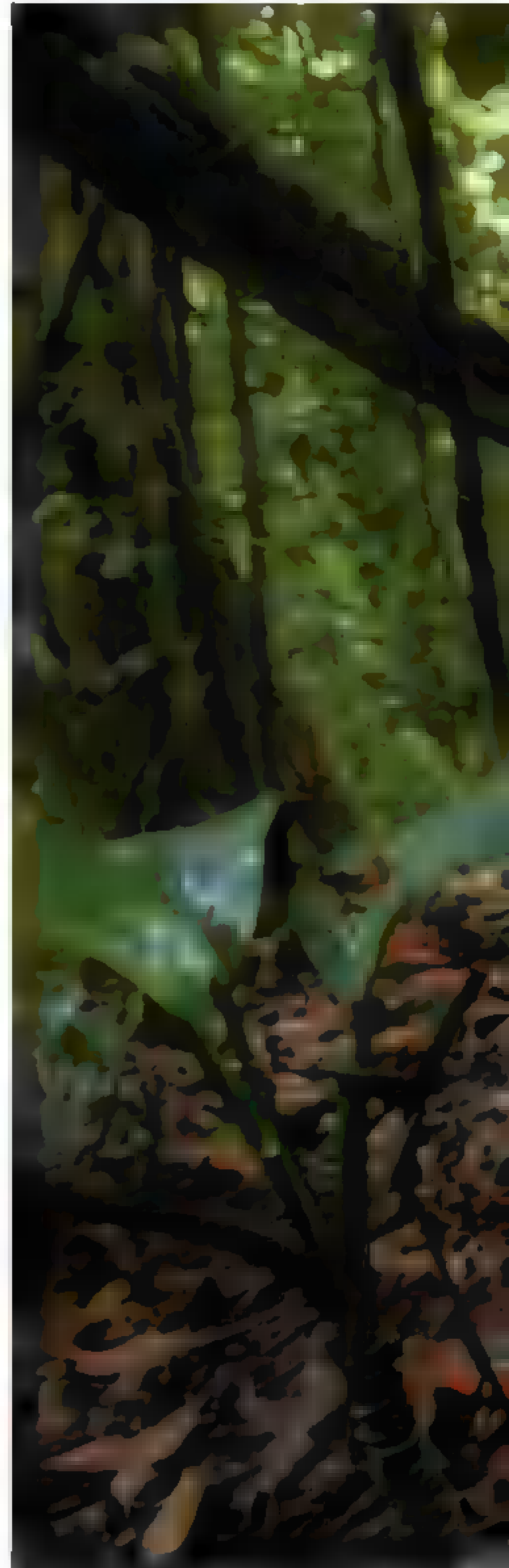
During the day these insects move little and are nearly impossible to distinguish from the sylvan backdrop they imitate, and that, of course, is the point: to remain invisible to sharp-eyed predators that use vision to hunt. Come nightfall, however, sticks and leaf katydids shake off their vegetal torpor to do some feeding of their own—on leaves and forest-floor detritus—at which point their ancient artifice can be admired by grace of our modern artificial lights.

We are drawn to mimicry and disturbed by it too. As children, we play dress up and let’s pretend, and we understand our fellow hominins through private reenactment. Our most elaborate masquerades—for Halloween, say, or the Day of the Dead—are often tangled up with our deepest fears. What self-respecting Hollywood slasher would be seen without his Munchian mask or mother’s wig?

Mimicry in nature likewise can charm or repel us, but whatever our human judgments, this

A finger-length katydid disguised as lichen-coated bark barely registers in the dim understory of a Panama forest. But camouflage is more than just looks—the wearer must also act the part. This nocturnal insect holds stock-still during daylight hours to help conceal its contours.

ACANTHODIS CURVIDENS



much is true: Scamming works, and the natural world abounds with P. T. Barnums, which fill every phyletic niche, sucker every sense. Biologists have barely begun to tally life’s feinting legions or trace the evolutionary and genetic details of each imposter’s disguise. Sometimes the deception serves as camouflage, allowing its bearer to elude detection by predators, prey, or quite often both: In Panama I found a mantid



that looked like a few sprigs of radicchio, the perfect cloaking device for a stealth hunter of leaf-eating insects that is itself much coveted by insectivorous reptiles and birds. At other times the swindler wants its merchandise to be noticed; that's the whole point. An anglerfish wags its head until its fleshy protuberance shimmies like a worm and baits other fish. Carrion orchids sprout large, purplish, fetid blossoms that

look and smell like dead meat to attract scavenger flies, which will alight on the flowers, get dusted with pollen, and maybe, just maybe, help the orchid breed.

The sensory form that an act of mimicry

Natalie Angier is a Pulitzer Prize-winning science writer. German-born Christian Ziegler has won several international awards for nature photography.

Mimicry in nature can charm or repel us, but whatever our human judgments, this much is true: Scamming works, suckering every sense.

takes varies according to the sensory talents of the mimic's target audience. Most familiar to us visual primates are the visual mimics, the ones adapted to fool the eye, like the riparian frogs that crouch in a riverbed and look as slick and round and inorganic as the polished stones around them, or the caterpillar that, when frightened, will hold up its front end to flash a fluorescent salmon pink face with a pair of scary snake eyes. But there are vocal mimics too, like a palatable species of tiger moth that deters bats by parodying the ultrasonic clicks of a toxic moth the bats detest, or like the greater racket-tailed drongo of Sri Lanka, which mimics the calls of other birds to drum up a mixed-species flock in which the drongos can more safely and efficiently forage.

Then there are olfactory mimics, such as that mad *parfumier* the bolas spider, which can lure male moths by secreting perfect knock-offs of the counterpart females' *eaux de toilette*. There are even tactile mimics, including a parasitic fungus that lives in the inner chambers of termite mounds, where it is kept warm, moist, and competitor free. Termites are notoriously zealous housekeepers. How does the fungus elicit indulgence rather than expulsion? By assuming the shape and texture of ripe termite eggs.

Mimicry fables can sound like O. Henry stories, offbeat dilemmas dapperly resolved. For example, caterpillars are voracious eaters. They chomp their way through many leaves in their lifetimes. Birds love fattened caterpillars, and as they fly overhead, they search for signs of caterpillar activity, most notably damaged leaves. To thwart the aerial reconnaissance, one species of caterpillar has adopted a novel dining style. Rather than tearing through foliage at random, the Geometridae caterpillar cuts its leaves deftly,

mincingly, moving along the edges like a seamstress with her scissors, in and out, zig and zag. By the time the caterpillar is done, the leaves may be much smaller, but their borders maintain their maiden serrated form.

Sometimes the best offense is a ghoulish pretense. Reporting recently in the *Proceedings of the National Academy of Sciences*, Leslie Saul-Gershenz and Jocelyn Millar described the case of the abominable blister beetle and the benighted solitary bee. Blister beetles live in the southwestern deserts of the United States. Females lay their eggs in grassy patches where solitary bees forage. The beetle eggs all hatch simultaneously, and the thousand or so newborn larvae immediately gather together into a tight formation. They form a nice oval shape, all dark and fuzzy. They travel as an inseparable unit, up and down the blades of grass. They look and act just like—a female solitary bee. Before long, they start releasing a pheromone mimic, and now they smell like a female bee too. A male bee lands on what he thinks is a mate, and the blister pack clings to him en masse. Disappointed by the encounter, and seemingly unaware of his cargo, the male bee flies on in search of new love. Should he find and approach a real female bee, the beetle larvae will instantly abandon him and cling to her. The female will take them where they want to go, back to her well-provisioned nest. The larvae will deplane, settle down, and gorge themselves to maturity on nectar, pollen, and, best of all, the bee's eggs.

Of course, even the most cunning of nature's caricatures have no narrative mastermind behind them. Mimicry exemplifies evolution by natural selection, the relentless struggle in which parents spawn a diversity of offspring that chance and nature's cruel eye for weakness shear almost clean away. If your slight resemblance



Resembling flora more than fauna, a female walking leaf of Malaysia stems from a long line of extreme leaf mimics. This insect group is little changed over 47 million years, judging from a recent fossil find in Germany. The largest of thousands of leaflike species, *Phyllium giganteum* can unfurl to some four inches in length.


to bird dung gives you enough of an edge that you survive to breed, your progeny may inherit your lucky guano cast. Maybe one will even top you as a droppings imposter, and within a few hundred generations the trait will have spread through the whole population and be the gold standard for your kind.

Mimicry also reveals just how messy evolution can be, how ad hoc and make-do. For example, Ximena Nelson and Robert Jackson report in the *Proceedings of the Royal Society* on the dilemma of the male *Myrmarachne*, a jumping spider. Like a number of the world's jumping spiders, these arachnids have evolved to look like ants, a strategy that plays into the antipathy many predators have for the aggressive, noxiously armed, and ecologically dominant social insects. But the male spiders have a problem with the basic strategy, for mating rituals demand that they sport elongated mouthparts, which could detract from the overall antlike effect. Evolution has hammered out a compromise: Whereas the female spiders look like ordinary ants, the males with their enlarged fangs have come to resemble ants carrying bundles in their mandibles, as worker ants sometimes do. Ingenious, yes, but not perfect. It turns out that although the male jumping

spiders are as effective as their female counterparts at deterring the generally ant-phobic among hunters, the males alone fall prey to predators that target ants least likely to fight back—those encumbered with bundles.

Scientists are particularly intrigued by imperfect mimicry, where one organism only vaguely resembles another. In some cases, the crude form may indicate a lineage newly embarked on the mimicry path, when evolution has only begun to hone the simulation. In other instances, the disjunction is a result of the mimicked species pulling away from its unwanted copycats. If the warning colorations that you have evolved to advertise your hard-won unpalatability are mimicked by too many edible free riders, your brand name will be cheapened and lose its protective value.

Mimicry can also be a great way to preen, or learn, or make a new friend. Among songbirds and humpback whales, competing males seem to imitate each other's songs. And some dolphins duplicate each other's flying leaps. Parrots are masters at parroting, and ape is what the great apes do, which is why orangutans can learn to cook pancakes and chimpanzees to hunt with tools, and we compare each other to a summer's day and mirror each other's joy with a smile. □



MAKE LIKE A TREE Leaf knockoffs down to brown spots and notched edges, two *Mimetica* katydids with twiglike legs can rest or feed without drawing attention. Still, their best efforts at blending in sometimes fail. Fleshy, protein rich, and toxin free, katydids are avidly sought and caught by keen-eyed monkeys, birds, lizards, frogs, and snakes.

MIMETICA MORTUIFOLIA (AT TOP); *MIMETICA VIRIDIFOLIA*





CATHEDRA SERRATA (TOP, BOTH); CEPHISE NUSPESEZ (RIGHT)

SHOW TWO FACES An extra pair of eyes, even phony ones, can be a boon to insects hunted by predators that target by sight. A saw-nosed plant hopper's first defense is camouflage (above left). But if a bird, lizard, or other hunter takes aim, the insect can startle its foe by unveiling red spots that could be mistaken for the eyes of a larger animal. A butterfly pupa (right), a species discovered in Costa Rica by Daniel Janzen of the University of Pennsylvania, also shows a false face. "Peering" from a rolled-leaf shelter, its eyespots may deter small birds exploring the foliage for insect prey. Though a prevalent ploy in nature, the fake-eye look isn't foolproof. Animals that get caught may have secondary defenses, like a foul taste or toxic secretion. The plant hopper takes a more spirited approach, buzzing like a stinging wasp to provoke a quick release.







FAKE YOUR ID Hiding in plain sight, the broad-headed *Hyalymenus* nymph (upside down) has evolved to look and act like sap-eating ants, much fiercer creatures that can sting or wield toxins, spines, and communal grit. Predators that learn to avoid the ants will also bypass the imposter. But the ploy is risky: If the ants discover the innocuous copycat among them, they'll attack.

HYALYMENUS SP. NYMPH (ANT MIMIC); *ECTATOMMA* SP. (ANTS)

CONFOUND THE ENEMY Modeling fake parts and elegant disguises, many caterpillars keep their enemies guessing. A silk moth caterpillar comes with a false head, complete with mock antennae (right), to lure predators into biting its rear. Plan B: If the ruse fails, extra spines on the real head may prompt the attacker to spit out its prey still intact.

Cryptic coloration and a shape like a leaf spine help shield a tropical Geometridae caterpillar (below), but its feeding behavior is the master stroke. By munching along a leaf's scalloped contours and keeping the edges well-balanced left to right, "it disguises the damage that could clue a predator to its whereabouts," says University of Utah biologist Phyllis Coley. For such a nondescript little inchworm, she says, "it's pretty sophisticated."



GEOMETRIDAE (LEFT); *PERIPHOPA ARCAEI* (ABOVE)



GET NOTICED For one nematode parasite, the goal is not to escape, but to be eaten. When it hijacks an ant, it turns its host's back end as red and prominent as ■ ripe fruit (right). "This likely dupes a bird into feeding on it and getting ■ mouthful of nematode eggs," says ecologist Steve Yanoviak. The bird spreads the eggs via its feces, which the ants eat, continuing the cycle.

In frogs, conspicuous colors often signal toxicity. But a species on islands off Panama doesn't stick to a single color signal (below). That's counterintuitive, says Martine Maan of the University of Texas at Austin. "We'd expect the frogs to look similar so predators could easily learn to associate toxicity and coloration." But another selective force is in play. Females on different islands have developed tastes for mates of different colors, probably driving male hues to diverge instead of merge. Still, the poison alarm seems effective. Most predators likely just avoid vivid frogs, Maan says, ■ precautionary tactic for a perilous world.

—Captions by Jennifer S. Holland



GOPHAGA PUMILIO (LEFT), CEPHALOTES ATRATUS (ABOVE)





Vanishing Venice

The world tugs at the lovely hem of the city Thomas
Mann called “half fairy tale and half tourist trap.”



For every resident Venetian, hundreds of visitors pour into the city each year to savor its gilded charms. Most will take in this view across San Marco Basin. Many could find themselves in *acqua alta*—high water.





The tide of tourism crests at Carnival, when crowds cluster around and near the Piazzetta San Marco. There are many other lovely places to linger. Mayor Massimo Cacciari advises, "Throw the map away. Get lost."





Young people gather at a neighborhood bistro. Growing tourism forces many residents to leave. But Venetian Emanuele Dal Carlo insists, "There's still time to reclaim the city. Ours is the last generation that can."

Nowhere in Italy, where calamity comes embellished with rococo gestures and embroidered in exclamation points, is there a crisis more beautifully framed than Venice. Neither land nor water, but shimmering somewhere in between, the city lifts like a mirage from a lagoon at the head of the Adriatic. For centuries it has threatened to vanish beneath the waves of the *acqua alta*, relentlessly regular flooding caused by the complicity of rising tides and sinking foundations, but that is the least of its problems.

Just ask Mayor Massimo Cacciari, broody, mercurial professor of philosophy, fluent in German, Latin, Ancient Greek; translator of Sophocles' *Antigone*; a man who raises the level of political intellect to just short of the stratosphere. Ask about the *acqua alta* and Venice sinking, and he says, "So go get boots." *Let them wear boots.*

Boots are fine for water, but useless against the flood that causes more hand-wringing than any lagoon spillover: the flood of tourism. Number of Venetian residents in 2007: 60,000. Number of visitors in 2007: 21 million.

In May 2008, for example, on a holiday weekend, 80,000 tourists descended on the city like locusts on the fields of Egypt. Public lots in Mestre, a mainland part of the municipality where people park and take the bus or train to the historic center, filled and were closed. Those who managed to get to Venice surged through the streets like schools of bluefish, snapping up pizza and gelato, leaving paper and plastic bottles in their wake.

La Serenissima ("the most serene one"), as Venice is known, is anything but. The world steps into the exquisitely carved font of the city, guidebook in hand, fantasies packed along with toothbrush and sturdy shoes. Splash! Out spill the Venetians. Tourism isn't the only reason for the accelerating exodus, but one question hovers like a haze: Who will be the last Venetian left?

"Venice is such a lovely city, said the director of a cultural foundation. From his window you could look across the San Marco Basin—with its unending flotilla of speedboats, gondolas, and water-buses called *vaporetti*—and beyond to the Piazza San Marco, epicenter of Venetian tourism. "Really, it is a huge theater. If you have the money, you can rent an apartment in a 17th-century palazzo with servants and pretend you are an aristocrat."

Please take your seats. In this play, Venice assumes a dual role. There is Venice the city where people live and Venice the city tourists visit. Lighting, sets, and costumes are so beautiful the heart aches, but the plot is full of confusion, the ending uncertain. One thing is certain: Everyone is madly in love with the title character.

"**BEAUTY IS DIFFICULT**," Mayor Cacciari said, sounding as if he were addressing a graduate seminar in aesthetics rather than answering a question about municipal policy. He quoted Ezra Pound (the American poet, buried in Venice) quoting Aubrey Beardsley's line to William Butler Yeats, a kind of literary game of telephone—but then indirection is as Venetian as the curves of the Grand Canal.

Cacciari, whose reputation for arrogance rivals his reputation for eloquence, seemed to be in a mood as black as his hair and luxuriant beard. (Not a streak of gray on his 63-year-old head. "Does he dye his hair?" I asked a press

officer. “No. He is very proud of that,” she answered.) The day before, a torrential downpour had flooded Mestre. Rain caused the flood, not acqua alta, Cacciari said, sitting in his office. “MOSE [the flood barriers under construction; see page 108] wouldn’t have helped. High tide is not a problem for me. It’s a problem for you foreigners.” End of discussion on flooding.

No, he pressed, the problems lie elsewhere. The cost of maintaining Venice: “There is not enough money from the state to cover it all—the cleaning of canals, restoration of buildings, raising of foundations. Very expensive.” The cost of living: “It’s three times as costly to live here as in Mogliano, 20 kilometers away. It’s affordable only for the rich or elderly who already own houses because they have been passed down. The young? They can’t afford it.”

Finally, there is tourism. Of that, Cacciari the philosopher said this: “Venice is not a sentimental place of honeymoon. It’s a strong, contradictory, overpowering place. It is not a city for tourists. It cannot be reduced to a postcard.”

Would you close it to tourists? I asked.

“Yes. I would close Venice—or perhaps, on reflection, a little entrance examination and a little fee.” He looked bemused.

Add the little fee to ridiculously high prices. Tourists pay \$10 to ride the vaporetto, \$13 for a soft drink at Caffè Florian, \$40 for a plastic Carnival mask, probably made in China.

Or you can buy a palazzo. “Grand Canal is prime,” said Eugenio Scola as we sat in his walnut-paneled real estate office overlooking San Marco. He wore a beautifully tailored black jacket, a crisp white cotton shirt, jeans with an alligator belt, and black loafers with the luster of polished calf. For years, buyers were Americans, British, and other Europeans, Scola explained. “But now we are seeing Russians. Also Chinese.”

Among his offerings was a three-bedroom restored apartment on the *piano nobile*, or main floor, of a small 18th-century palazzo, or palace. “*Molto bello*,” Scola said, pulling out the plans. There was a studio, library, music salon, two living rooms, a small room for the help, and a fine view from three sides. Only nine

million euros. If I preferred, there was an entire palazzo—the 60,300-square-foot Palazzo Nani, to be offered with a permit allowing its conversion to another use. “It will probably become a hotel,” Scola said. When I asked for something more affordable, I was taken the next day to see a 388-square-foot studio that would give a sardine claustrophobia, but it was only 260,000 euros. Someone would buy it as an investment or pied-à-terre. But probably not a Venetian.

IF YOU ARE A VENETIAN, and not part of what Henry James called the “battered peep-show” of tourist Venice, if you are a resident who lives in a fifth-floor walk-up apartment (elevators are rare in Venice), someone who gets up, goes to work, goes home, Venice is a different place altogether. The abnormal is normal. A flood is routine. The siren sounds, protective steel doors come down. Boots, essential to any Venetian wardrobe, are pulled on. The two and a half miles of *passerelle*—an elevated boardwalk supported on metal legs—are set up. Life goes on.

Here, where everything anyone needs to live and die must be floated in, wrestled over bridges, and muscled up stairs, time is measured by the breath of tides, and space bracketed by water. The mathematics of distance, an accounting of footsteps and boat timetables, is instinctive to every Venetian.

When Silvia Zanon goes to Campo San Provolo, where she teaches middle school, she knows it will take 23 minutes to walk there from her apartment on the Calle delle Carrozze. She leaves at 7:35 a.m. Memi, owner of a neighborhood trattoria, seated at a table reading the newspaper, looks up and nods. The young man collecting trash for the garbage barge mumbles a greeting. She turns onto the Campiello dei Morti and passes a wall draped with a white climbing rose; a bridge, two squares, another left in front of a former movie theater, now a trendy restaurant, and she proceeds on to the

Cathy Newman is an editor at large for the magazine. Jodi Cobb has worked in more than 50 countries. Her stories for the magazine include “21st-Century Slaves.”



Frezzeria. Ahead is the Correr Museum and cleaning ladies on hands and knees with buckets and brushes. She crosses the Piazza San Marco, blissfully empty in early morning. "I step on the paving stones and fall in love with the city all over again," she says. Another bridge, a brisk walk across the Campo San Filippo e Giacomo, and she arrives. It is exactly 7:58.

Listen. Venice should be heard as well as seen. At night the eye is not distracted by the radiance of gilded domes. The ear can discern the slam of wood shutters, heels tapping up and down the stone steps of bridges, the abbreviated drama of whispered conversations, waves kicked against the seawall by boats, the staccato of rain on canvas awnings, and always, always, the heavy, sad sound of bells. Most of all, the sound of Venice is the absence of the sound of cars.

Often Franco Filippi, a bookstore owner and writer, cannot sleep, and so he gets up and threads his way through the maze of streets, flashlight in hand, stopping now and then to

Luscious decay is a constant, as is maintenance. Repairing a foundation damaged by flooding means draining the canal, then clearing it of mud. To live in Venice is costly, but locals like this couple at the Casino of Venice willingly pay the price.

play a beam over facades of stucco and stone until the cylinder of light picks out a roundel of carved stone, called a *patera*, depicting some fantastic beast that slithers, prowls, or flies. It is then, while the city sleeps and he is rapt in the contemplation of a touchstone of its past, that he reclaims his Venice from the crowds that fill the streets, squares, and canals when it is day.

Gherardo Ortalli, a professor of medieval history, finds his path less poetic. "When I go out in the *campo* with my friends, I have to stop because someone is taking a photograph of us as if we are aboriginals," he says. "Perhaps one day we are. You go and see a sign on a cage. 'Feed the Venetians.' When I arrived 30 years ago, the population was 120,000. Now it is less than 60,000."



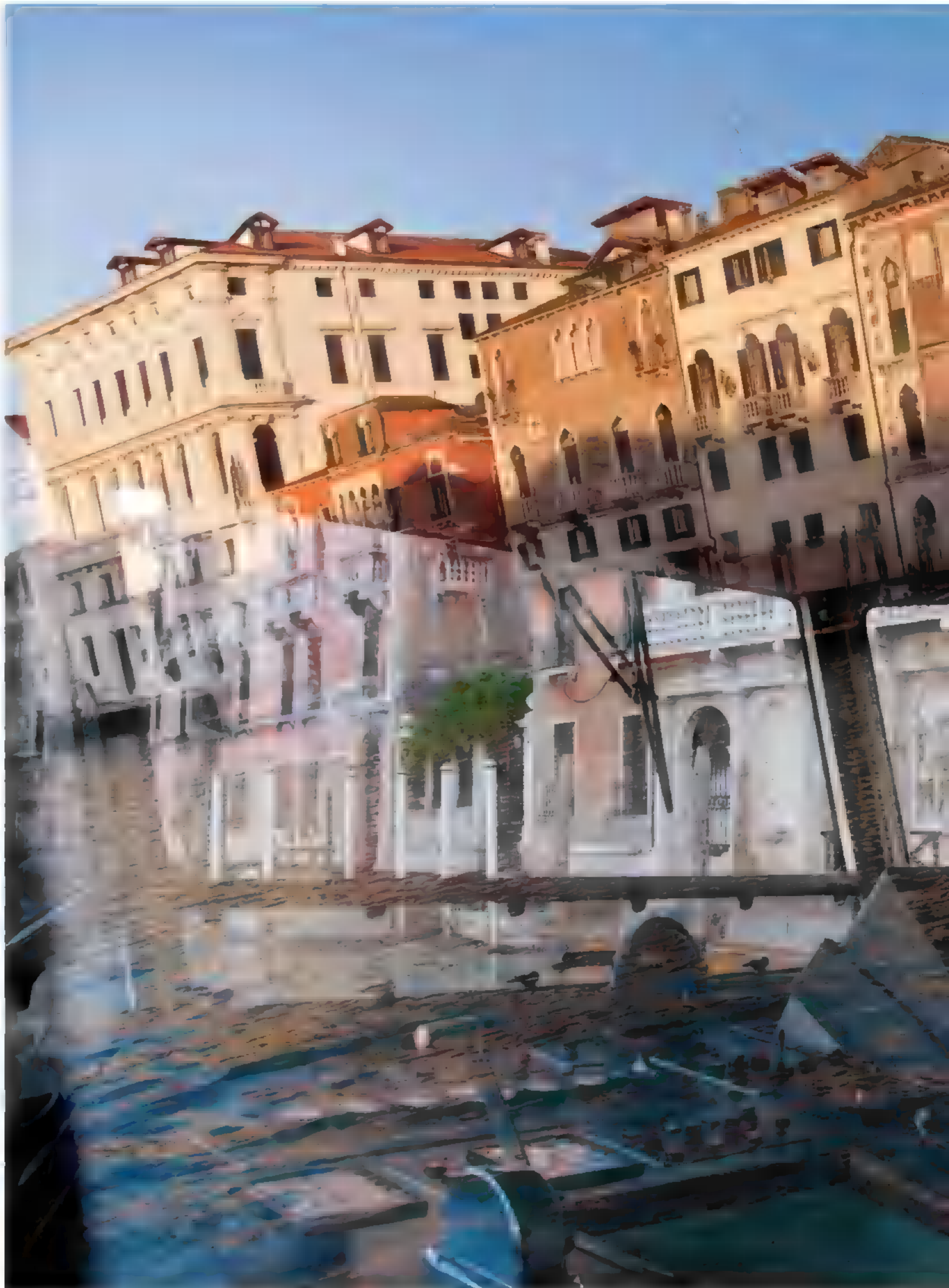
The decline seems inexorable. Last year alone, the resident population fell by 444. Ortalli thinks Venice will end up as simply a theme park for the rich, who will jet in to spend a day or two in their palazzo, then leave. It is 10 a.m., and he is headed toward a kiosk in the Campo Santa Margherita to buy a newspaper before going to his office, though you can hardly find the papers for the jetsam and flotsam of tourist kitsch: miniature masks, gondola pins, felt jester caps. “Everything is for sale,” he sighs. “Even Venice.”

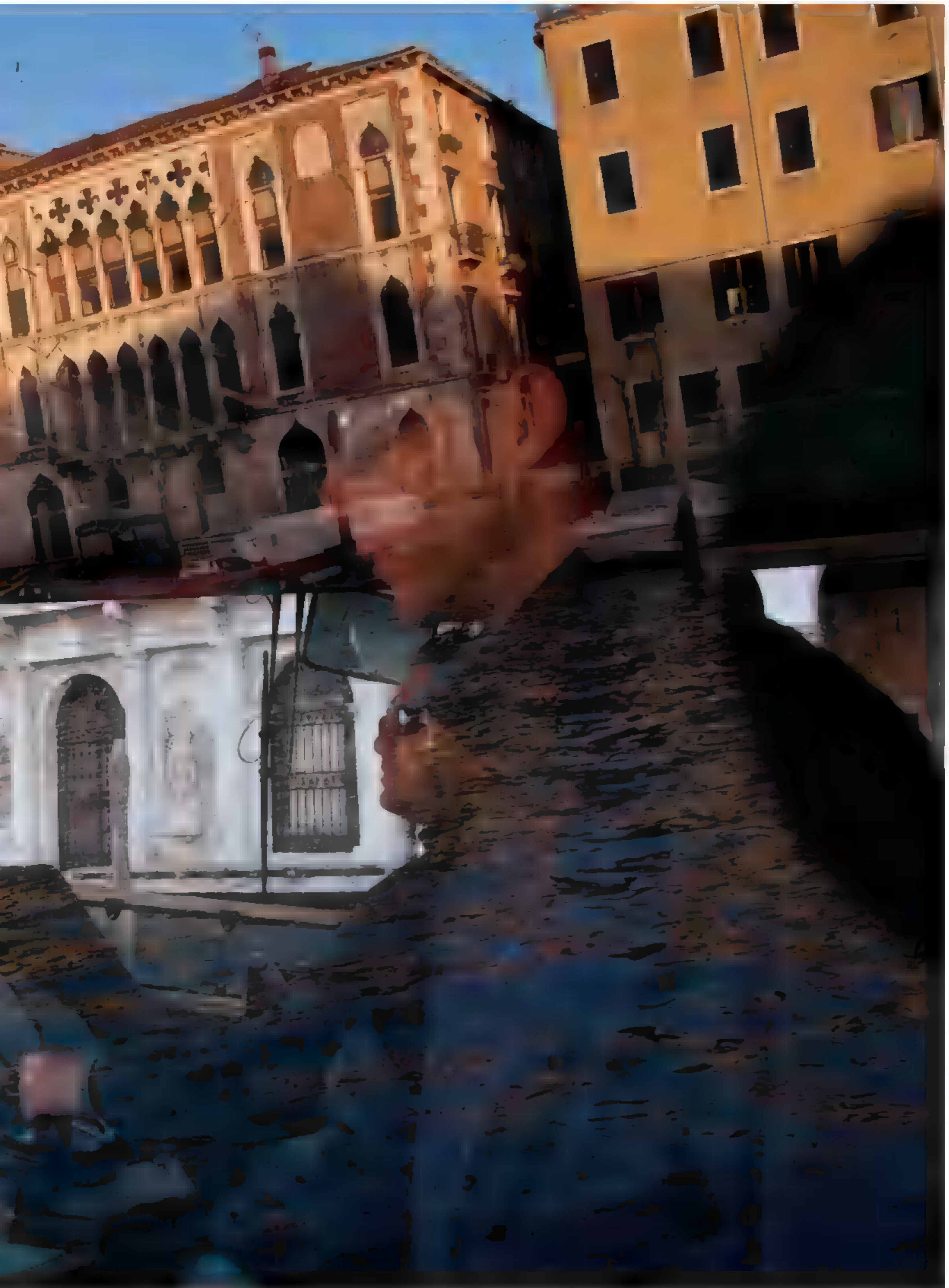
Meet the official charged with the solemn duty of managing the wear and tear of tourism. His name is Augusto Salvadori, and his card introduces him as

*Director of Tourism
Promotion of Venice’s Tradition,
History, and Culture
Protection of the Town’s Propriety
and Cleanliness
Prevention of the Wear Caused by the Waves
Street Signage*

Love is not too strong a word—in fact, it is inadequate to describe how Salvadori feels about Venice. He is not just the city’s director of tourism and promoter of tradition; he is its defender. If Salvadori could command it, every balcony would be draped with geraniums. (He distributed 3,000 plants with that in mind.) Once, dining at a canalside restaurant, he leaned over the table to reprimand a passing gondolier for singing “O Sole Mio,” a Neapolitan, not Venetian, song.

In fall 2007 he dispatched a commando of volunteers to spread the gospel of neatness in the Piazza San Marco, to remind visitors to follow the commandments of good behavior: not to eat, drink, or sit anywhere other than in designated areas. “We are fighting for the dignity of Venice,” Salvadori says. In spring 2008, he announced decorum week; 72,000 plastic bags were distributed to residents so that they could dispose of dog poop. Useful, except that no one provided extra trash cans for the used bags.





The workhorse of public transport is the vaporetto, or water-bus. It threads the Grand Canal, here reflected in the pilothouse window. The thoroughbred gondola (425 remain) is a romantic indulgence for tourists.



Tronchetto, an artificial island made of dredged canal mud, serves as a parking lot for traffic from the mainland.

0 mi 1/4
0 km 1/4

VIRGINIA W. MASON, NG STAFF
SOURCES: CITY OF VENICE, FORMA URBIS, PROVINCE OF VENICE—TOURISM SERVICE

“The city is consumed by tourism,” says Salvadori, seated in his office in the 16th-century Palazzo Contarini Mocenigo. “What do Venetians get in exchange?” A frown as his brow plummets. “Services are strained. During part of the year Venetians cannot elbow their way onto public transportation. The cost of garbage collection increases; so does the price of living.” Does it ever, particularly when it comes to residential property. A 1999 law that eased regulations on the conversion of residential buildings to tourist accommodations exacerbated an ongoing housing shortage. Meanwhile, the number of hotels and guesthouses since 1999 has increased by 600 percent.

“**PERHAPS TO HELP,**” Salvadori says, “we put a city tax on hotels and restaurants. They say tourists will not come—but I say, tourists won’t

come for a few euros?” He glares. “I cannot be worried about hotels. I have to think of the Venetians. My battle is for the city. Because Venice”—his voice softens, he touches his chest—“is my heart.”

Tourism has been part of the Venetian landscape since the 14th century, when pilgrims stopped en route to the Holy Land. With the Reformation of the 1500s, tourism lagged, but regained momentum in the 17th century as upper-class Europeans, intent on acquiring the fine sheen of cultural experience, embarked on a “grand tour.”

So, what’s so different about tourism now? I ask Ortalli, after he has settled into his office. “Yes, there was the grand tour,” he replies. “But then people were invested in hospitality. Now, Venice gets giant cruise ships. The ship is ten stories high. You can’t understand Venice from

ISOLA DI
SAN MICHELE
(CITY CEMETERY)

PLACES TO STAY Of Venice's six districts, or *sestieri*, Cannaregio has the most residents, San Marco the most tourists. A 1999 law made it easier to convert residences into hotels and guesthouses, further diminishing the housing supply for locals.



ten stories up. You might as well be in a helicopter. But it's not important. You arrive in Venice, write a postcard, and remember what a wonderful evening you had."

The malady is chronic. The onset of infection, says art historian Margaret Plant, dates to the 1880s, when the city "was fetishized, and its face was turned resolutely to the past. At that point zealously guarded Venice became a commodity city, a package of the totally picturesque. Its own citizens were confirmed as a lower order."

The contagion seeps down streets, climbs bridges, and crosses the piazza. "There goes another piece of Venice," Silvia Zanon, the teacher, said sadly when La Camiceria San Marco, a clothing store located near the Piazza San Marco for 60 years, had to move to a smaller, less prime spot because the rent had tripled. The shop, quintessentially Venetian, tailored

pajamas for the Duke of Windsor and sport shirts for Ernest Hemingway. "It's like leaving the house where you were born," said Susanna Cestari, who had worked there 32 years, packing boxes for the move.

In August 2007, Molin Giocattoli, a toy store so popular an adjacent bridge was called the Bridge of Toys, closed. Since December 2007, ten hardware stores have gone out of business. In the Rialto market, souvenir sellers have replaced vendors who sold sausages, bread, or vegetables. Tourists will not notice. They do not visit Venice to buy an eggplant.

They do, however, come to get married. The tourist machinery has incorporated weddings—720 in 2007. Predictably, nonresidents who married in Venice that year outnumbered residents by nearly three to one. Should you wish to tie the knot, the marriage office of the City of Venice will oblige for \$2,400 on weekdays. On weekends, \$5,500. Would the happy couple like the ceremony broadcast on the Internet? One hundred ninety dollars, if you please.

As for Carnival—once a charming, neighborhood event, now a commercial frenzy ("a cultural hijacking," Robert C. Davis, a professor of history at Ohio State University, wrote in *Venice, the Tourist Maze*)—sensible Venetians leave town.

One thing the Venetians haven't abandoned is their cynicism. When the exodus is complete, if the city ends up as nothing more than an exquisite, gilded bonbonnière, "Who will be the last Venetian left?" a woman whose family reached back generations was asked. "I don't know," she replied. "But certainly the last Venetian will want to be paid for it."

Meanwhile, plans for the city's salvation appear and disappear with the regularity of the tides, but the stakes couldn't be higher: Tourism in Venice generates \$2 billion a year in revenue, probably an underestimate because so much business is done off the books. It is, reports the University of Venice's International Center of Studies on the Tourist Economy, "the heart and soul of the Venetian economy—good and bad."

Some people suggest that Venice's wounds are



self-inflicted—the sequelae of the drive to wring every last euro, yen, and dollar out of tourism. “They don’t want tourists,” observes a former resident, “but they want their money. American tourists are best. They spend. Eastern Europeans bring their own food and water. Perhaps they buy a little plastic gondola.”

There is talk, always talk (this is Italy) about limiting tourists, taxing tourists, imploring them to avoid the high seasons of Easter and Carnival, but tourism—intertwined with the loss of resident population, complicated by the power of hoteliers, gondoliers, and water taxi drivers, who have an interest in maximizing the influx of visitors—defies simple solutions.

“Let me remind you, the loss of population... is not only a problem in Venice but in all historical towns, not only Italy,” cautioned Mayor Cacciari. “The so-called exodus, which dates back very far in time, is deep rooted in the lodging issue.”

Redemption may be out of reach. “It is too late,” Gherardo Ortalli, the historian, says.

There is life in Venice (440 births in 2007), but an aging population, falling birthrate, and families who leave (by barge, of course) for more affordable housing on the mainland have reduced residents from 150,000 to 60,000 in five decades.

“Nineveh is finished. Babylon is finished. Venice will remain. That is, the stones will remain. The people won’t.” But for now there is still life as well as death in Venice. Franco Filippi walks at night in search of carvings on weathered walls. Silvia Zanon leaves for school, crosses San Marco only to fall in love with the city again, and, assuming it is in season, you can still manage to buy an eggplant.

“Venice may die,” Cacciari insists. “But it will never become a museum. Never.” Perhaps. In 1852 art critic John Ruskin wrote that the Doge’s Palace would not be standing in five years. A century and a half later, it does.

To glide from the slate green waters of the lagoon past San Giorgio Maggiore to the San



Marco Basin, to approach the Doge's Palace with its tracery of arches and columns, to see it as the doges must have—enthroned on a gilded barge surging through a silver sea, oars dipping and rising, banners pulled taut by wind—is to see that beauty, difficult and bruised, survives.

As does romance. What is Venice—so seductive, so lethally attractive—except the most sublime setting for the trilling of the heart?

For example, one fall day not long ago two children, 12 and 13, from Grosseto, a town in Tuscany, decided to run away. Their parents disapproved of their romance, so they saved and spent their allowance on a train to Venice. They walked narrow streets paved in stone and lingered on the bridges that vault the canals. Night approached, and with it the need for a place to stay. They arrived at the Hotel Zecchini, a modest guesthouse with an inviting orange-and-white awning. The clerk heard a small voice ask about a room, looked up, saw nothing, leaned over the desk, and looked into the faces of two

children. Skeptical of their story about an aunt who would arrive soon, he gently questioned them, listened, then called the carabinieri.

"Such innocence and tenderness. They just wanted to be together," said Elisa Semenzato, the hotel manager. When the carabinieri arrived, they took the pair on a tour of the city in their boat, then to district headquarters in a former convent and put them to bed in very separate rooms. The next day they were served a three-course meal on a table set with linens in a hall facing the 15th-century courtyard.

Romance triumphs; reality intrudes. The parents, less than enchanted with the Romeo and Juliet narrative acted out by their children, arrived that afternoon to take them back to Grosseto, away from the soft ache of first love and the gilded beauty of Venice.

Kisses end. Dreams vanish, and sometimes cities too. We long for the perfect ending, but the curtain falls along with our hearts.

Beauty is so difficult. □



Framed in the windows of the Caffè Florian, well-heeled tourists become flamboyant extras in the opulent theatrics of Carnival, when fantasy is embellished with waterfalls of lace and voluptuous silks.







Though the acqua alta frequently floods low-lying parts of town like the Piazza San Marco, residents simply put on boots and accept it as a mild inconvenience for the privilege of living in Venice.

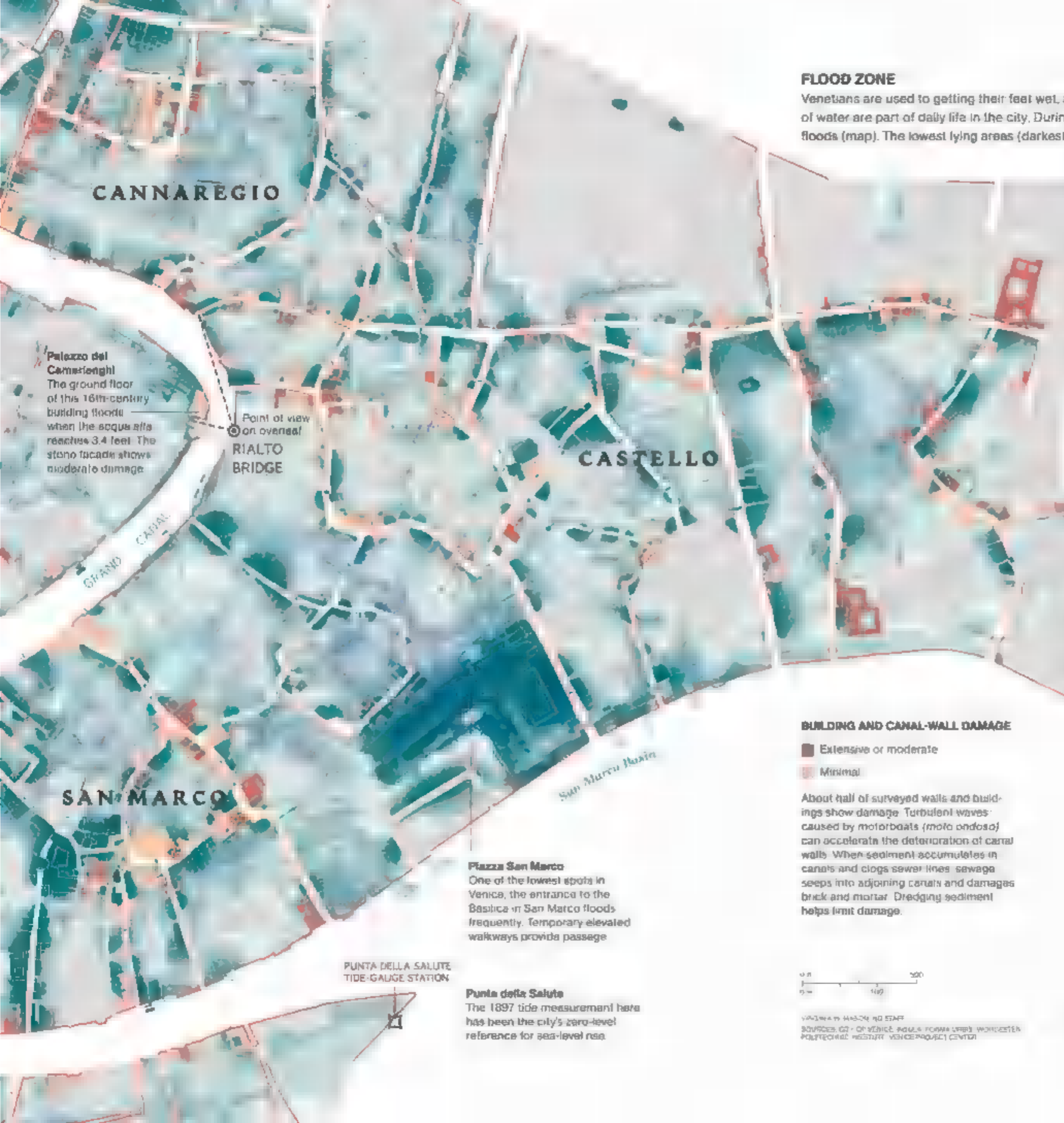


GRAND CANAL

SANTA CROCE

SAN POLO

DORSODURO



CANNAREGIO

CASTELLO

SAN MARCO

Palazzo del Camerlengo
The ground floor of this 16th-century building floods when the acqua alta reaches 3.4 feet. The stone facade shows moderate damage.

Point of view on overhead
RIALTO BRIDGE

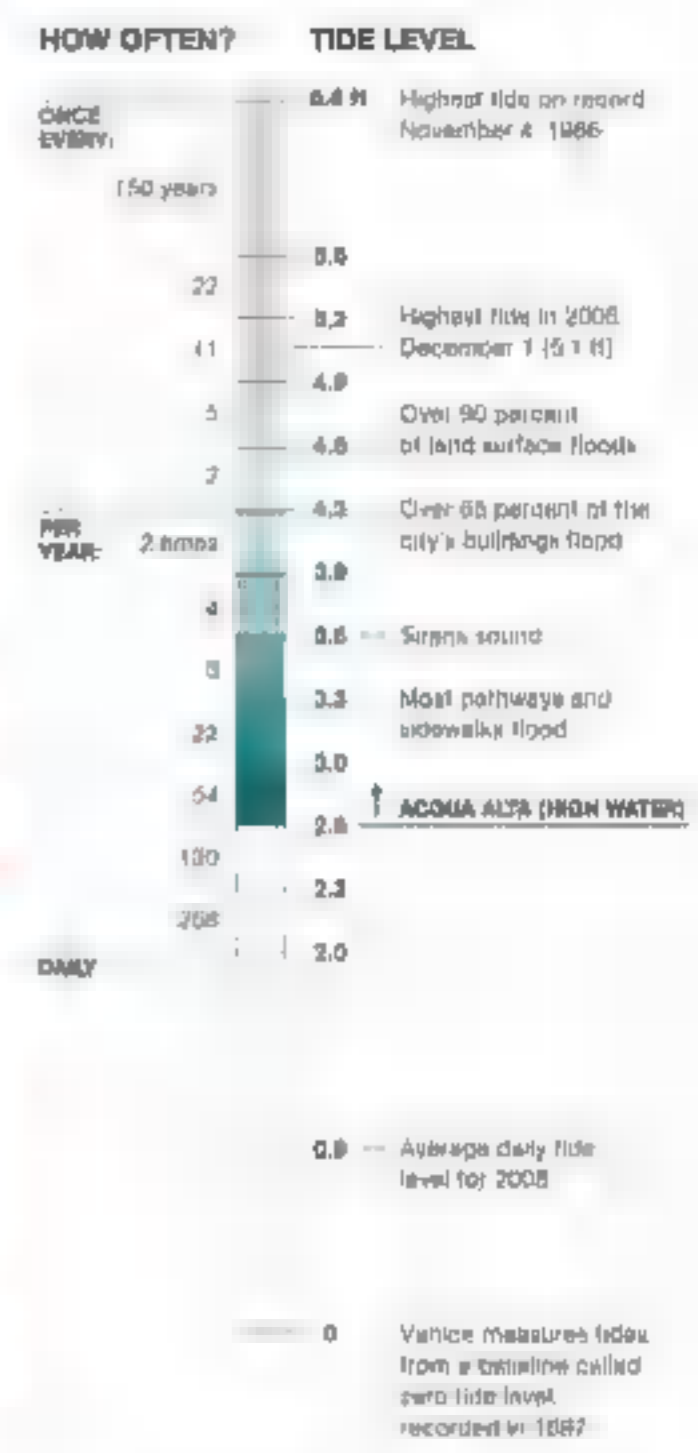
Piazza San Marco
One of the lowest spots in Venice, the entrance to the Basilica in San Marco floods frequently. Temporary elevated walkways provide passage.

PUNTA DELLA SALUTE TIDE-GAUGE STATION

Punta della Salute
The 1897 tide measurement here has been the city's zero-level reference for sea-level rise.

FLOOD ZONE

Venetians are used to getting their feet wet, and efforts to alleviate the long-term effects of water are part of daily life in the city. During the *acqua alta*, unusually high tides cause floods (map). The lowest lying areas (darkest blue) are most often inundated.



BUILDING AND CANAL-WALL DAMAGE

- Extensive or moderate
- Minimal

About half of surveyed walls and buildings show damage. Turbulent waves caused by motorboats (*moto ondoso*) can accelerate the deterioration of canal walls. When sediment accumulates in canals and clogs sewer lines, sewage seeps into adjoining canals and damages brick and mortar. Dredging sediment helps limit damage.

Circles mark buildings most likely to flood, due to location and structure, when area is underwater.



MAP BY M. HADON AND STAFF
SOURCES: GOV. OF VENICE; AQUA FORA (FRA); WORKSHOP POLITECNICO VENEZIA; VENEZIAQUA (CIVIT)

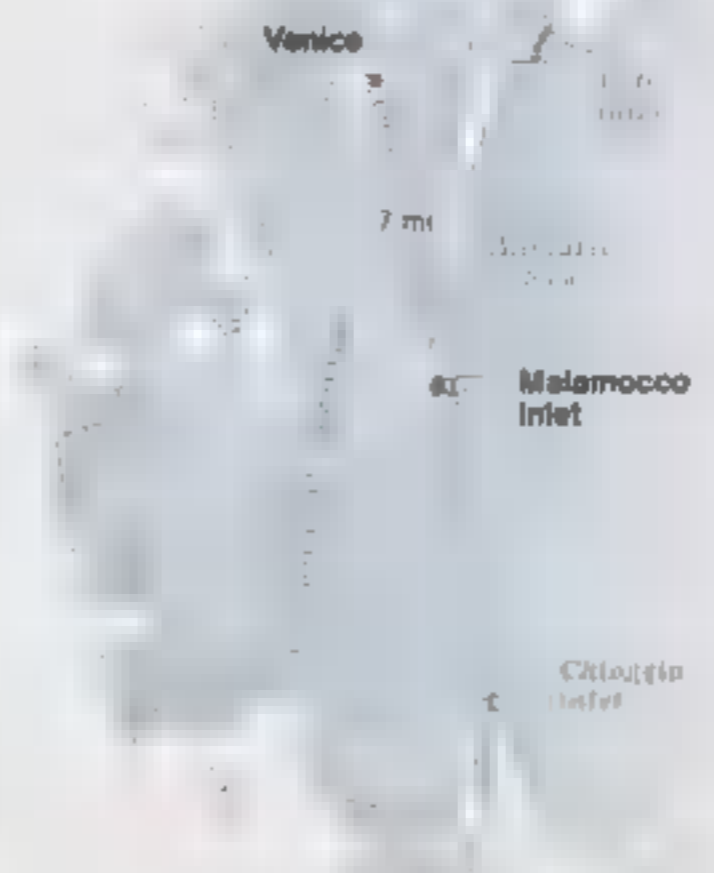


TIDE LEVEL SCALE ROUNDED TO NEAREST TENTH
FREQUENCIES BASED ON 1989-2008 MEASUREMENTS
FLOOD INFORMATION MAP BASED ON AN INTERPOLATED MODEL OF BUILDING, BODYPART, AND PIAZZA ELEVATION DATA

VENICE

VERSUS

THE SEA



MOSE: TO STEM THE TIDES

The MOSE project, begun in 2003 and projected to be complete in 2014, will string four barriers made up of 78 floodgates—at a cost of nearly six billion dollars—across the three inlets (left) to Venice's lagoon. The gates, raised when unusually high tides threaten flooding, will block seawater from pouring into the lagoon. Controversial from the start, the project provoked years of political wrangling as well as worries about lagoon ecology.

How it works

- 1 Hollow steel gates filled with water lie flat in housing caissons built into the lagoon bed at each inlet.



DETAIL OF MALAMOCCHO BARRIER



REINFORCED BARRIERS AND ALLEGEDLY TUMBLING STONE FOUNDATIONS OF VENICE'S PALACES AND STRUCTURES WERE DESTROYED BY THE MOSE PROJECT. THE VENICE WATER AUTHORITY THREATENS TO SINK OR REMOVE THE PALACES AND STRUCTURES IF THE MOSE PROJECT IS NOT STOPPED.

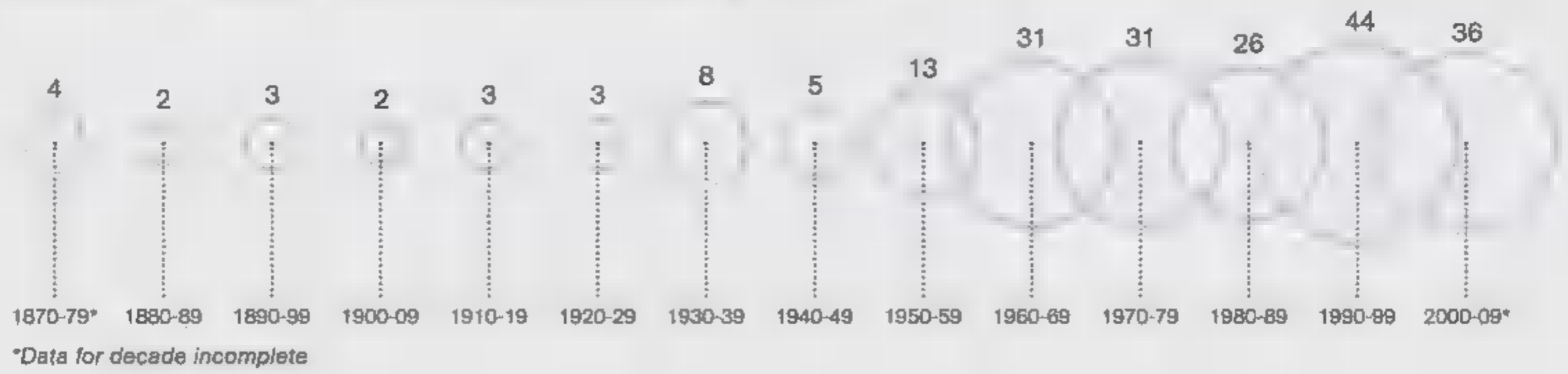
Buildings and MOSE barriers drawn to scale. Tide level scale rounded to nearest tenth.



The Venetians put down roots—on a cluster of islands in a lagoon at the north end of the Adriatic Sea—by driving alder and oak piles into the sandy ground. Atop these foundations they built homes and palaces and began a battle against the ceaseless rise and fall of the tides. The city's structures, despite reinforcements, have suffered the assault of brackish water, sea-level rise, and subsidence (sinking)—some five inches in the past century. Excessive pumping of groundwater contributed to subsidence.

BEYOND THE BRINK

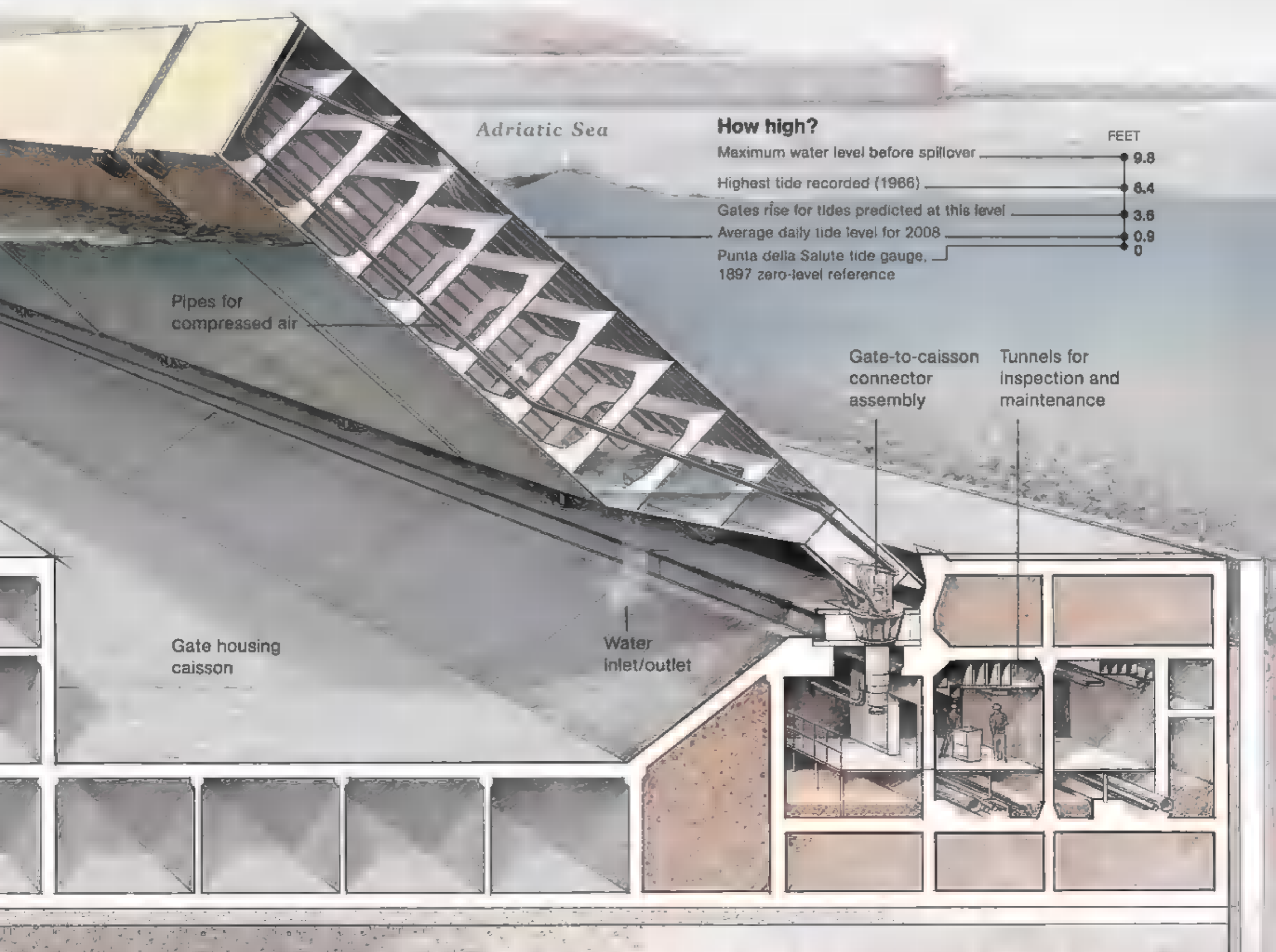
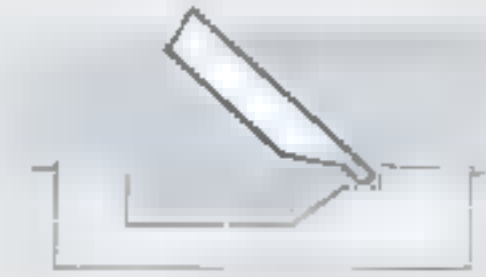
Number of times water rose to a level of 3.6 feet or higher.



2 When a flood is predicted, air is pumped into the gates to displace water and make them buoyant, allowing them to rise within a half hour.



3 Fully elevated, the gates separate sea from lagoon. When the tide recedes, water flows back into the gates to lower them.





Isn't she lovely?

From across the vast and parched Arabian Peninsula, camels converge on Abu Dhabi for an annual beauty contest. Here the traditional beast of burden becomes a pampered show animal.







Along Million Road, a marketplace named for the huge sums camel caravan command, some of the contest's 24,000 entrants jostle for space with their gas-guzzling counter parts. Prizes include more than 140 cars and trucks.



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Some competitors use camel calves to lure antsy mothers to the gate. Once inside the parade grounds, a turn before the judges marks the end of a long walk for many of the camels, from Oman, Qatar, and distant quarters of Saudi Arabia.



On this night—the final night—a fog swirled across the desert, as thick and impenetrable as a sandstorm. It made mysteries of the stars, and spies moved across the dunes in darkness. They searched from camp to camp in the strange air, looking for something special. ■ The quest hadn't started this way, with espionage in the dark. For a month before this January night, Bedouin caravans had trekked great distances across the Arabian Peninsula, from Oman,

Saudi Arabia, Qatar, and elsewhere. They had come to a remote spot in the Abu Dhabi emirate to take part in the show: a beauty pageant for camels.

For nine days the animals paraded before a grandstand—camels of all sorts, the most prestigious being groupings of 35 females—and imperious judges waved away the homelier groups with their dejected owners. As the days passed, the judges rewarded certain standards with dispatch, winnowing a field of some 24,000 contestants.

By the tenth day just two Bedouin men remained with their resplendent beasts. The men—who as elder heads of their families went by family names, Bin Tanaf and Rames—would face each other in a meeting fraught with intrigue and rivalry, since they were cousins from the same tribe. For years they had jostled for position and prestige at smaller contests, and the result now would decide each man's place not only in the world of camels but also within his very tribe. The winner stood to leave with extravagant prizes, yes, but more important, with family honor.

So each sent spies. Beauty spies, who scoured the camps for the one especially gorgeous camel that—once purchased—might give him an edge when the sun rose and judgment began.

Consider, for a moment, the camel. Note the great hump, the lolling mound of fat that sways with each step of the skinny legs. The knock-knees and flat feet less happy at a run than a galumph. See the neck, too, drooping as if under the weight of the head. And then the

head itself: the absurd eyelashes fluttering above oblong nostrils and rubbery lips, from which dribbles a stream of thick, white cud. This is not a creature of surpassing beauty, surely; this is a creature of spare parts.

But the judges in Abu Dhabi view camels with different eyes, scrutinizing them from nose to tail and back again, evaluating each according to strict criteria. Her ears must be firm. Her back high, her hump large and symmetrical. A rump that's not too big, with just enough room for a saddle. The hair, of course, must shine. A good head is massive. Her nose should have a strong arch in the bridge, sloping toward a bottom lip that hangs down like a bauble. A long neck appeals. As do long legs. And the judges examine the two toes of the feet, looking for what their guidelines call "toe-parting length."

Because so many beauty pageants, in the end, do come down to cleavage.

Bin Tanaf, a small man with a game leg and a tidy black beard that belies his advancing years, sat on a dune overlooking his camels and reflected on nomadic life. He grew up traveling with his family from one oasis to another in a perpetual search for pasture and water. In summer the camels could go five days without water and in winter many weeks. "With them, we survived," he said, lifting his chin toward his camels.

This relationship, this love between nomad and camel, began thousands of years ago in the heart of the Arabian Peninsula. Camels, first and foremost, provided transport across the desert. They were also mounts for raiding rival tribes, to



*In the shade of an elegantly appointed
dallah, men gather to share fruit, drink
coffee and coffee, and socialize the old-
fashioned way in an atmosphere filled
with respect and public conversation.*





Bedouin traditions of hierarchy persist even in the grandstand, where spectators—princes and sheikhs in front—overlook the parade grounds and judging pens (opposite). This patch of Abu Dhabi featured little but dunes until recently, when the emirate's ruling family established a camel pageant.

claim or reclaim other camels. During the first half of Bin Tanaf's life his family's camels produced milk for drinking and hair for weaving into blankets and tents. Dung for fueling fires. Urine, even, for a hair wash, to keep lice away.

Since Bedouin life centered on movement, land held no value for them; instead, camels became the measure of a man's wealth. And so, a whole vocabulary of distinctions arose to describe them. *Asayel* are the noble red camels. *Majahim* are dark. A female baby camel is a *houraa*, a new mother a *bikr*. A male at puberty is a *fahl*, and a female is *jathaa*, unless the male has been with her recently and her udder has

begun to swell, in which case she is a *laqha*. No stage in a camel's life, no moment of growth or excitement, escaped attention. The two species, man and camel, suffered and exulted as one.

Then, Bin Tanaf said, something changed. After thousands of years of sameness, life altered in radical ways. The British left in 1971, ceding control of an oil gush that rained down on the Bedouin. The tribal emirs banded together to form the United Arab Emirates with Abu Dhabi as their capital, and money—a great rolling wave of money—flooded the desert.

Bin Tanaf entered the automobile business. Oil-rich residents bought cars at a furious clip, and he shipped them from overseas makers to the emirates, Saudi Arabia, Kuwait. His compatriots made their fortunes in construction or shipping or in oil itself. They had grown up not just poor but with no conception of poor, and now the morning sun could hardly climb over their mountains of money. Unable themselves to read or write, they sent their sons to study English in London and French in Paris. They



migrated one last time, from camel-hair tents to glass skyscrapers in Abu Dhabi and Dubai.

Throughout much of the peninsula the nomad came to embody two conflicting ideas. At first city dwellers—themselves hardly removed from the desert—regarded the occasional sand-dusted Bedouin visitor as a rural curiosity, a bumpkin who carried his possessions in a sack. But that image is now giving way to something more romantic: the nomad as the quintessential Arab, a symbol of freedom. The Arab who gives no thought to oil, but merely to food and water for his camels as he rides into the sunset.

Rube or hero, he unavoidably resembles the American cowboy. And just as well-to-do Americans breed, race, and show their horses, so do Bedouin with their camels. The Arabian gentleman, like the American, spends his weekends at his stables. He examines his animals,

Matthew Teague regrets that he has yet to ride a camel. Randy Olson has photographed numerous camels, but none as cosseted as these.

feeds them special food, showers them with affection. He barks at them, then sings a song of forgiveness. He loves them.

And he prepares, all the time, for fierce competition.

The contest arena itself embodied the nomadic lifestyle, taken to its most luxurious degree. The Bedouin erected a multistory grandstand, banked with plush chairs and lined with big-screen televisions that featured live footage of the contest below, all in a tent. Serving boys ran about with tea and tins of burning incense that the men waved into the folds of their *ghutras*, or head-dresses. Outside, the helipad awaited the arrival of sheikhs and princes. The women spent each day shopping at a nearby *suq*, a market the size of a small town, built especially for the event.

Bedouin camps dotted the landscape around the site, and with each dawn, participants would walk their camels to the arena. Row upon row of luxury sport-utility vehicles—more than 140 Range Rovers, Nissans, Toyotas, all prizes for

various winners—framed the staging area. The judges awarded secondary prizes to single camels, to very young camels, even to male camels.

On the climactic day of the greatest contest—the caravan-size parade of females—Bin Tanaf and his cousin Rames looked over their camels. Their spies had chosen well in the night. By sunrise Rames had secretly spent two million dollars on several remarkably fetching camels. Bin Tanaf had spent more than a million on just one. Now the men moved unhurriedly, even as the sun rose into the sky. Their culture, rooted in the nomad's need for perpetual motion, values the relative luxury of stillness and calm. To be waited upon indicates rank and status. So each man wanted to show up last at the arena, to make his appearance with a peacock-like display of poky grandeur.

One of the contest organizers arrived at Rames's camp to nudge him into action. "Rames, I worry that the judges will close the gate."

Rames gazed about serenely. He carries himself with the stature of a king. "Do not worry," he said. "They will not close the gate."

Some distance away Bin Tanaf paced among his camels, awaiting word that Rames had left his stables. Bin Tanaf is the sheikh of his tribe, which gives him a position of authority, even over Rames. But in recent years Rames had cultivated a friendship with Crown Prince Mohammed bin Zayed Al Nahyan—who, as it happened, was the festival's patron—giving Rames an advantage, perhaps, in affairs of both camel and family.

Bin Tanaf waited. Then his cousin started moving toward the arena. Bin Tanaf signaled for his camels to move as well. Gradually he drew near the arena, and—horror! The upstart Rames had draped his camels in blinding silver capes, like a whole company of opera singers heaving in from stage left. Rames had spent \$20,000 a month on special camel food, and it showed. At the gate his caretakers whipped off the camels' capes to display their enchanting necks and undeniably symmetrical humps.

The two groups of animals paraded before the crowd. Then the two men took seats of honor in the grandstands to await the judges' decision.

A contestant protests as it is hoisted aloft for a massage to limber it up for competition. After the pageant most of the camels revert to their workaday role, trekking along ancient routes on the long journey home.



Singers gathered, and loudspeakers blasted their voices into the tent. Helicopters circled overhead, tilted on their sides so this or that royal family member could see the proceedings. Meanwhile, the cousins sat with matching nervous smiles, as though affected by some shared rictus.

At last the announcement: Bin Tanaf.

In a fit of exuberance the men of Bin Tanaf's family flung their headdresses into the air, shouted praises, and lifted their beaming sheikh onto their shoulders. Still unsatisfied, they climbed onto a marble table and lifted him higher; the whole pile came down when the table broke, projecting oranges, grapes, and men off the front of the grandstand. They regrouped on the ground below and danced a wild dance, swinging their camel crops overhead.



In one sense Bin Tanaf's reward could easily be described in modern terms: an enormous long-haul truck, some cash, a trophy. But his true victory—a victory of maneuvers, and passion, and spies in the dark—spoke of something older and greater by far.

The celebration back at Bin Tanaf's camp lasted all night. Two hundred Bedouin men sang, recited poetry, and told camel tales. Another group bashed their Land Cruisers into moonlit sand dunes at high speeds, spraying sand over a group of laughing children. Bin Tanaf and his eldest son, Mohamed, sat on the floor of an open tent, talking with friends around a communal platter heaped with rice and meat. The father's face burned with joy. "This is the best

day of my life," he said. After a few minutes two men approached carrying another platter, this one bearing a distinctive yellowish hillock. "Ah," the son said. "The hump."

That's the other thing camels provided during those long centuries in the desert. The much admired hump provided sustenance for the camel first, then later for its rider. So the camel's beauty is a practical one: A well-formed hump means nourishment. The slit-like nostrils can close tight against blown sand. Its spindly legs hold it aloft from the heat of the desert floor.

The camel's wide, flat foot, with its two spread toes, may seem strange to outsiders. But the Bedouin see only heart-shaped footprints leading over the dunes of Arabia, and across the shifting sands of time. □



Alejandro Tumas (left) and Hernán Cañellas plumb the depths of Yellowstone.

ON ASSIGNMENT Under Yellowstone One of the biggest volcanoes on Earth lurks beneath America's oldest national park. Yet no one's ever modeled it—until now. Senior Graphics Editor Alejandro Tumas and freelancer Hernán Cañellas (above) illustrated the supervolcano's depths. "If this were to explode, it would be the end of the world," says Tumas. "The possibility of that happening anytime soon is remote—a giant asteroid striking Earth is more likely. But we do know it will erupt. It's a question of *when*, not *if*."



Villagers bear the body of a slain gorilla in Brent Stirton's prizewinning photo.

Top Honors For the second year in a row, *National Geographic* took the top prize for photojournalism (below) at the American Society of Magazine Editors' National Magazine Awards. Honors went to photographer Brent Stirton's coverage of killings and the charcoal trade in the Democratic Republic of the Congo for "Who Murdered the Virunga Gorillas?" which appeared in the July 2008 issue of the magazine.





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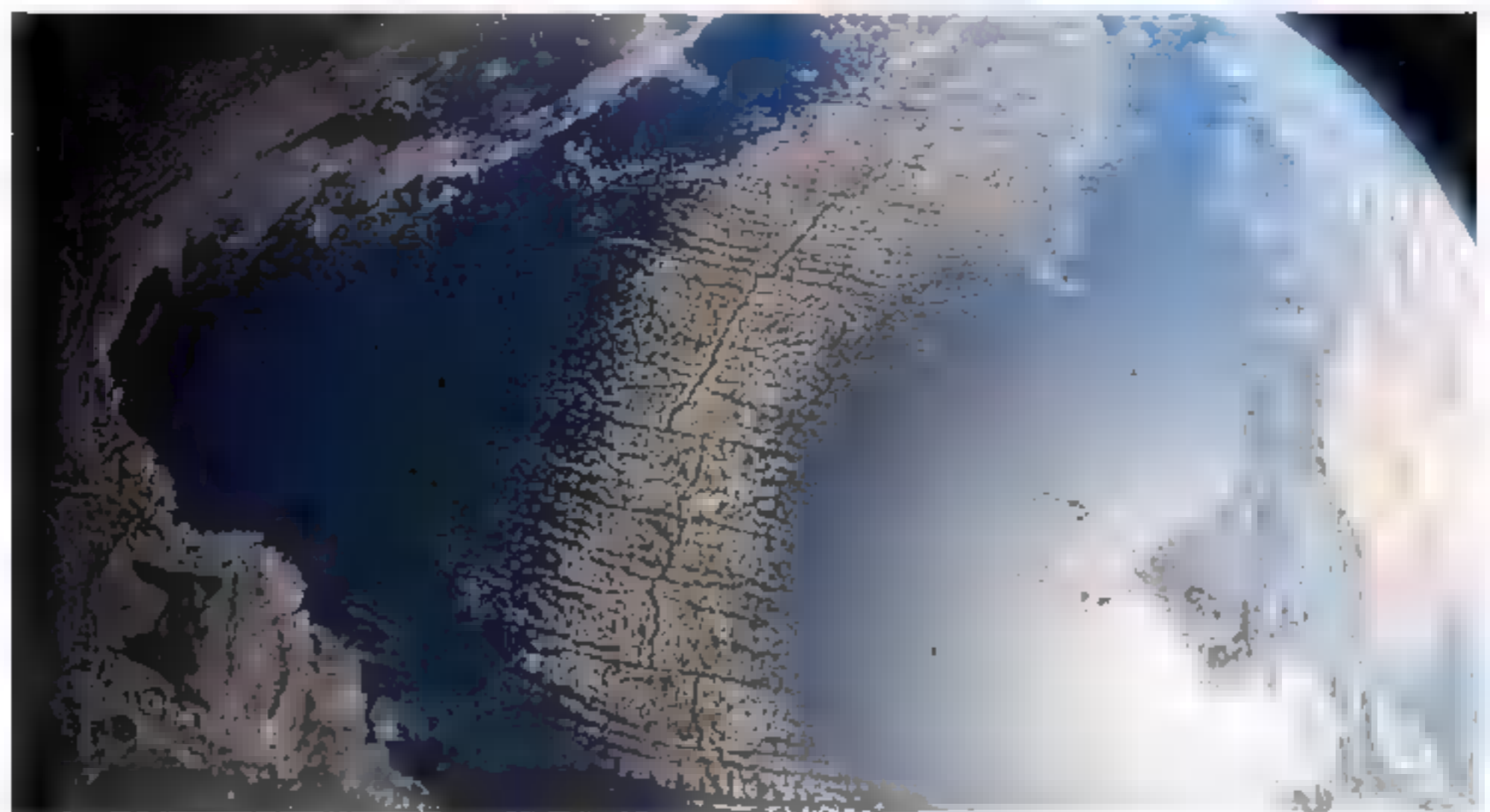
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INSIDE GEOGRAPHIC



Oceans Away With software that can turn sonar into 3-D images, the time has come for a computer-generated voyage to the bottom of the sea. *Drain the Ocean* unveils a Pacific canyon bigger than the Grand Canyon, ■ 40,000-mile-long mountain chain, and coral mounds as tall as skyscrapers. Air date is August 9 at 9 p.m.



In the Mid-Atlantic Ridge (center), landscapes are still forming.



Yuliya Klichkova and a park ranger are on watch for bears in Kamchatka.

ON ASSIGNMENT Bear Tactics Photographer Randy Olson and his assistant, Yuliya Klichkova (above), spent ■ week working close to the bears of Kuril Lake in Kamchatka, Russia, hoping for an underwater shot. An opportunity finally arose, giving Olson time for just two frames—one of which was a knockout (see page 28). The salmon-obsessed beasts never hurt the interlopers, but Klichkova—who grew up in Kamchatka—kept flares in her pockets for quick access in case things got ugly. “They weren’t looking at us as ■ food source,” says Olson. “But,” he acknowledges, “when something that big is within four feet of you, it’s ■ little unnerving.”

GeoPuzzle Answers

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"We believe in the work of National Geographic and wanted to be involved," says John Spinelli. He and his wife Shirley grew up reading *National Geographic* magazine and passed that love on to their children and grandchildren. Now retired, they enjoy in-line skating, tennis and bird watching.

The Spinellis set up a charitable gift annuity which provides them with steady income and tax savings while supporting the Society's efforts worldwide. "National Geographic is an important source for solutions to the challenges facing our planet," says John. "We want the world to be in good shape for our grandchildren."

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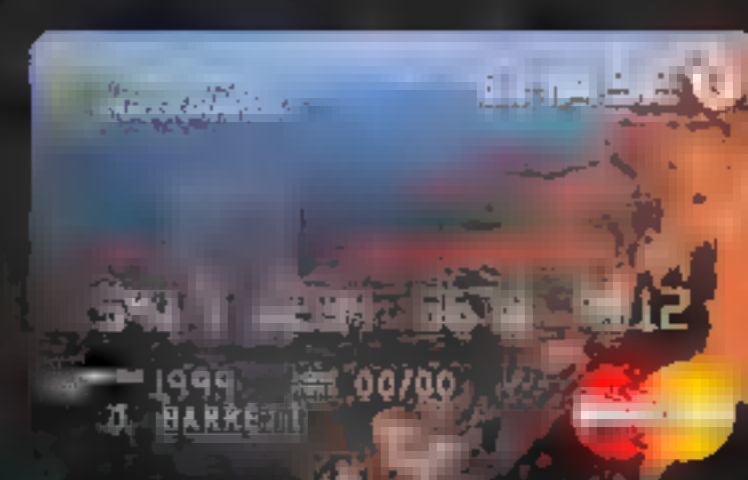
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Springs Eternal "Late that next afternoon we had our first close view of the enchanted land, when our party came upon the Mammoth Hot Springs," wrote photographer William Henry Jackson, who accompanied explorer Ferdinand Hayden on his 1871 expedition to Yellowstone. Jackson packed, muleback, some 300 pounds of equipment on the journey, including hundreds of fragile glass plates upon which he developed images on-site. Yellowstone's thermal pools proved to be more than just photogenic, according to Jackson; they also helped speed the photographic process: "By washing the plates in water that issued from the springs at 160° Fahrenheit, we were able to cut the drying time more than half." His pictures were instrumental in persuading Congress to declare the area a U.S. national park—the country's first—the next year. —Margaret G. Zackowitz

👉 **Flashback Archive** Find all the photos at ngm.com.

PHOTO: WILLIAM HENRY JACKSON. NATIONAL GEOGRAPHIC STOCK

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A settlement has been proposed in a class action lawsuit alleging that TriCor manufacturers engaged in anticompetitive conduct regarding fenofibrate drugs. Fenofibrate drugs are used to treat high cholesterol and high triglyceride levels in patients at risk of cardiovascular disease.

No question is raised about the safety or effectiveness of TriCor or other fenofibrate drugs.

Defendants have denied any wrongdoing and liability but have agreed to the proposed settlement to resolve the controversy and to avoid the cost and expense of further litigation. The lawsuit, *In re TriCor Indirect Purchaser Antitrust Litigation*, C.A. No. 05-360 (SLR), is pending in U.S. District Court for the District of Delaware.

You may have important legal rights under this settlement, some of which you must act on by **September 15, 2009**.

Who is included?

The class includes consumers and insurance companies that purchased, paid for, or reimbursed purchases of fenofibrate products intended for consumption by yourself or your family, or, in the case of third-party payors, by members, employees, plan participants and beneficiaries or insureds, between April 9, 2002 and May 8, 2009. These products include TriCor, Lofibra, Antara, Triglide, and any available generic versions of these drugs.

What does the settlement provide?

The settlement provides \$65.7 million to pay to class members. It will be distributed according to the settlement. Any award for attorneys' fees,

expenses, and notice and administration costs will be deducted from this amount.

What are my legal rights?

- **Remain in the class and file a claim.** Claim forms must be postmarked by **September 15, 2009**. You will be bound by the terms of the settlement and you give up the right to sue at your own expense.
- **Remain in the class but object to (or comment on) the settlement.** If the settlement is approved and your objection is rejected, you are bound by the settlement terms and you will receive payment from the settlement fund (if you also file a claim). Objections and comments must be postmarked by **September 15, 2009** and they will be considered at a Fairness Hearing on **October 9, 2009**. If you want to appear at the settlement hearing, you must send in a written request for appearance postmarked by **September 25, 2009**.
- **Exclude yourself** and keep your right to sue at your own expense. Requests for exclusion must be postmarked by **September 15, 2009**.
- **Do nothing.** You remain in the class and give up your right to sue at your own expense. You will not receive any money unless you submit a claim.

The Court will determine whether to approve the settlement and attorneys' fees at a Fairness Hearing scheduled on **October 9, 2009 at 1:30 p.m.**

**This is only a summary of the Proposed Settlement.
For complete information and a claim form:**

Visit: www.TricorSettlement.com Call: 1-877-567-3014

**Write: TriCor Indirect Purchasers Antitrust Litigation,
c/o Rust Consulting, Inc., P.O. Box 24797, West Palm Beach, FL 33416**

Free safes being doled out to public

Armored Safe giveaway ends public worry for those who rush to buy up hoards of brilliant, never-circulated U.S. Gov't issued coins that never lose their cash value



■ **HELP IS ON THE WAY:** This never-before-seen photo captures the rapid shipment of free Presidential Armored Safes that are now being shipped to U.S. citizens all across the country. The World Reserve is handing out the Armored Safes free to the general public who rush to beat today's published deadline to buy up the newly released World Reserve Collection of never-circulated U.S. Gov't issued coins and currency. Those who get through by calling the National Delivery Hotline at 1-866-964-2951 and beat the 7 day order deadline will get the Armored Safes for free.

By Shawn Oyler

UMS - Imagine finally getting something that will never lose its value.

Sounds too good to be true?

Well, it's true and word is quickly spreading about the free handout of Armored Safes that are being stocked full of never-circulated U.S. Gov't issued coins and currency that by law will never be minted again.

These free Armored Safes are being turned over to the general public who make it in time to beat the order deadline for their share of the hoard of brilliant, never-circulated U.S. Gov't coins and currency before the 7 day shutoff.

"The frantic demand for U.S. Gov't coins has caused the U.S. Mint® to officially halt the sale of many of its most valuable coins," said lead consultant for the World Reserve Thomas C. Harris, Retired Deputy Director of the U.S. Treasury Bureau of Engraving and Printing.

"Today, the World Reserve began to release this hoard of U.S. Gov't coins and currency in a free Armored Safe to the general public. Having valuable U.S. Gov't coins serves as an economic life raft. This valuable Collection will never, never, never lose its face

value. You will always have something worth a lot of money," said Harris.

Here's the best part, among the U.S. Gov't issued coins and currency that everyone gets is the highly sought after American Eagle 1-ounce silver bullion coin made from solid .999 fine silver, 250 new 2005 U.S. Buffalo Nickels in sealed rolls, a banker's stack of historic \$2 bills and a full vault tube of the Presidential Golden Dollar Coins.

Here's why that is so important. Just think if you would have saved the same number of never-circulated Eisenhower Dollar coins from 1974. Remarkably, they would now be worth 500% more in collector value.

This gives you a hint that these are not the same grade as the coins found in loose change, or from the local bank. In fact, these coins remain in brilliant, never-circulated condition if left sealed and untouched.

U.S. Gov't Savings Bonds used to be a favorite way to keep money safe and popular to give as gifts. But no one can take a Savings Bond and go buy something with it.

That's why this hoard of valuable coins gives everyone the comfort of having full control of their money. No

matter what, they will never lose their U.S. cash value.

If times ever get really tough any coin in the hoard could be used to buy anything. But unless it is a good reason, only a fool would do that because this personal hoard of money is already worth so much more in collector value.

"So many people are buying up these coins. Even for those people who give away some of their collection as gifts, they are keeping the Armored Safe for themselves," said Robert Anthony, Director of the private World Reserve Monetary Exchange.

"This Safe is one of the absolute best places to keep valuables and important papers. People will now have a safe place to store their wills, guns, jewelry, antiques, keys, coins and even cash," Anthony said.

"The only problem the Safe creates is when it's time to read your Will. You need to make sure everyone knows who you want to leave it to," he said.

"When Americans get their hands on this Safe and their very own personal hoard of U.S. Gov't Coins, they'll really do a double take. Everyone will feel like they just won the lottery," he said. ■

How to get the free Armored Safes

All those who beat the 7 day order deadline for each personal hoard of U.S. Gov't issued coins and currency from the World Reserve Collection will actually be awarded the Presidential Armored Safes absolutely free.

Eligibility: Certain restrictions apply: Open to the public only, sorry no dealers. Those who miss the 7 day deadline will be turned away from this free offer and required to wait for future announcements, in this or other publications. The entire World Reserve Collection must be obtained to get the safe free.

Terms & Conditions: To receive delivery of your free Armored Safe, you'll only need to cover \$149 for the first shipment of coins. Then the same amount for the last remaining shipment to cover the entire collection of 267 U.S. Gov't coins. THE NO-WORRY GUARANTEE ENSURES THAT REFUNDS BE GRANTED FOR ALL ITEMS PROPERLY RETURNED, LESS SHIPPING FOR 90 DAYS FROM THE DAY YOU RECEIVE YOUR SAFE AND FIRST SHIPMENT. THAT MEANS, CANCELLATION WILL REQUIRE THE RETURN OF THE FREE ARMORED SAFE. FAILURE TO DO SO WILL REQUIRE REMITTANCE FOR THE SAFE OF FOUR HUNDRED AND THIRTY SIX DOLLARS. THE WORLD RESERVE MONETARY EXCHANGE, INC. IS NOT AFFILIATED WITH THE U.S. GOVERNMENT, A BANK OR ANY GOVERNMENT AGENCY. THE INCREASE IN COLLECTIBLE VALUE OF CERTAIN PRIOR ISSUES OF U.S. COINS DOES NOT GUARANTEE THAT CURRENT ISSUES WILL ALSO INCREASE IN VALUE. OH AND FL RESIDENT TRANSACTIONS REQUIRE THE REMITTANCE OF APPLICABLE SALES TAX. SORRY NO SHIPMENTS TO VT AND MA RESIDENTS. ADVERTISEMENT FOR WORLD RESERVE MONETARY EXCHANGE, INC. 8000 FREEDOM AVE., N. CANTON OH 44720.

TO GET THE FREE SAFES USE THIS

**FREE CLAIM CODE:
US 6309**

AND CALL 1-866-964-2951
BEFORE THE 7 DAY ORDER SHUTOFF



7 Smart places to stash your cash

By Robert Anthony

So you're still hiding money under the mattress or in the bread box?

Well, you're not alone. Ever since financial institutions have been dropping like flies, millions of Americans have stopped relying solely on their banks.

1. Be sure your bank is insured. If you're not sure if your bank is FDIC insured find out or get your money out. They only have enough cash on hand to cover about 2% of nationwide deposits. So it's not always wise to keep all your eggs in one basket.

2. Start and grow a coin collection. Coin collections are tangible assets that will always keep their face value, instead of just owning stocks that could depreciate or lose you money.

3. Keep cash safe at home. Cash is King. Believe it, but remember not to keep it in a thief's favorite spot; like in the bread box or the mattress. These will never have the protection that a quality home safe can provide.

4. Savings Bonds, an old favorite. Savings Bonds are an easy way for your money to stay safe in the future. However, if lost or stolen they could be difficult to replace unless the serial number was kept in a safe place.

5. Gold and silver still shine. If you own gold or silver, great, hold on to it. But if you don't, one of your best bets is to try to get as many U.S. Gov't issued gold and silver coins as you can.

6. Hold on to real estate. With interest rates at historic all-time lows the market is sure to recover and property values will once again bounce back. So those who hold on to their homes for the long term will likely reap the benefits of these investments.

7. Buy a good safe. Home safes become an absolute necessity during economic turmoil. But, because of the huge spike in recent sales, safes may be hard to come by.

With all this you'll be much safer, just in case your bank is the next to fail. ■

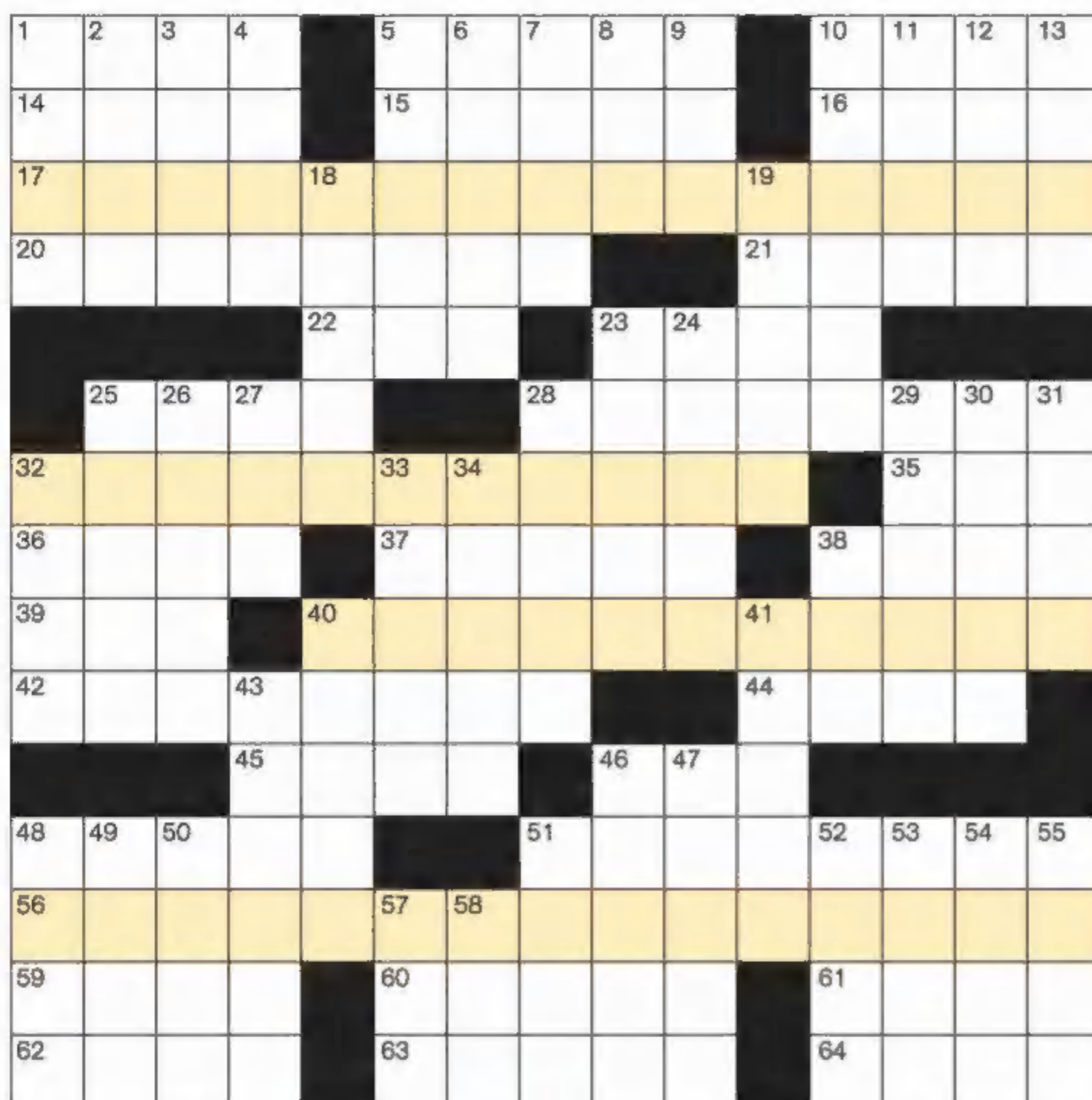


■ **LIKE WINNING THE LOTTERY:** Everyone gets the personal hoard consisting of 267 never-circulated U.S. Gov't coins and currency including 12 Presidential Golden Dollar Coins in a sealed Vault Roll and a heavy vault brick containing 250 never-circulated U.S. Buffalo Nickels and, best of all, a solid .999 fine silver American Silver Eagle and a banker's stack of 4 historic \$2 bills. If times ever get really tough, any coin in this collection could be used to buy anything. Keep it as long as you can because this hoard is already worth so much more than face value.



■ **NO MORE WORRIES:** Carol Ford of Perry, OH said she hit the jackpot when her free Armored Safe was delivered. "I already have some old coins, but I wanted these U.S. coins as a nice nest egg. Now I can keep all my important papers and my Dad's gun in my new safe," she said.

GEOPUZZLE



Depth in Venice

Puzzle by Cathy Allis

Venice's watery setting is part of its allure but can take a toll. The story on page 88 mulls the city's mystique—and the plans to protect this treasure from the sea. The tinted clues for this puzzle probe the threats to Venice.

ACROSS

- 1 Suds source
- 5 Gelato, for one
- 10 Spiced Indian tea
- 14 It means "bone," on Italian menus
- 15 Instruction on a Wonderland cake
- 16 Vaporetti : motors :: gondolas : ___
- 17 What the *acqua alta* does in a place where Venetians shop?
- 20 Venetian deluge of a sort
- 21 Straight from the vine
- 22 Dissenting vote
- 23 "This," in Spain

- 25 Deer dad
- 28 Erudite types
- 32 Venice has to implement one often?
- 35 Predetermined
- 36 Ill-mannered
- 37 Ms. Jones, Grammy-winning singer of "Don't Know Why"
- 38 Org. that fights for rights
- 39 Muckraker Tarbell
- 40 Delivers financial aid in Venice, not always via a canal?
- 42 A medium seen in Venice's Correr Museum

- 44 Venice is one
- 45 Song and dance, e.g.
- 46 It's *due* in Venice?
- 48 Readies for the OR
- 51 Fortifies, as with sandbags
- 56 Venetian business event during high water?
- 59 Its cap. is Quito
- 60 Gypsy composer Jule
- 61 Over again
- 62 Related by blood
- 63 Strained, as one's patience
- 64 Four-stringed instruments, for short

DOWN

- 1 Like the *g*'s in San Giorgio Maggiore
- 2 Norway's largest city
- 3 Not worth ___ (as valueless as an old coin)
- 4 Indigent
- 5 Giuseppe's bride in *The Gondoliers*
- 6 Unkempt
- 7 Ordinal endings
- 8 Soul, in Nice and Nancy
- 9 President pro ___
- 10 Bull pen?
- 11 Saltwater cousin of the cod
- 12 Greek war god
- 13 Narrow strip of land: abbr.
- 18 Australian canine
- 19 "Sweet" stream in a Robert Burns poem
- 23 Dazzling display
- 24 Persian royals
- 25 Mecca native, e.g.
- 26 Kind of wave Venice doesn't welcome
- 27 Suds of a sort
- 28 No-fat nursery rhyme fellow
- 29 English race that's always a tie?
- 30 Race involving handoffs
- 31 Bowl over
- 32 Verve
- 33 Needing a new bulb, perhaps
- 34 Animation creations, informally
- 38 Fighting foe of Frazier and Foreman
- 40 Iranian language
- 41 Squash variety
- 43 New Guinea native
- 46 Yours of yore
- 47 Courted
- 48 Court entry
- 49 Humphrey's *Casablanca* role
- 50 Prefix with distant
- 51 Mythological river encircling Hades
- 52 Jacob's womb mate
- 53 Went the way of Venice's foundations
- 54 "Gold" keeper in a 1997 film title
- 55 Seating at St. Mark's
- 57 Widely used spring-to-fall hrs.
- 58 Glance or loss lead-in

Answers in *Inside Geographic*



Recycles Sunshine.

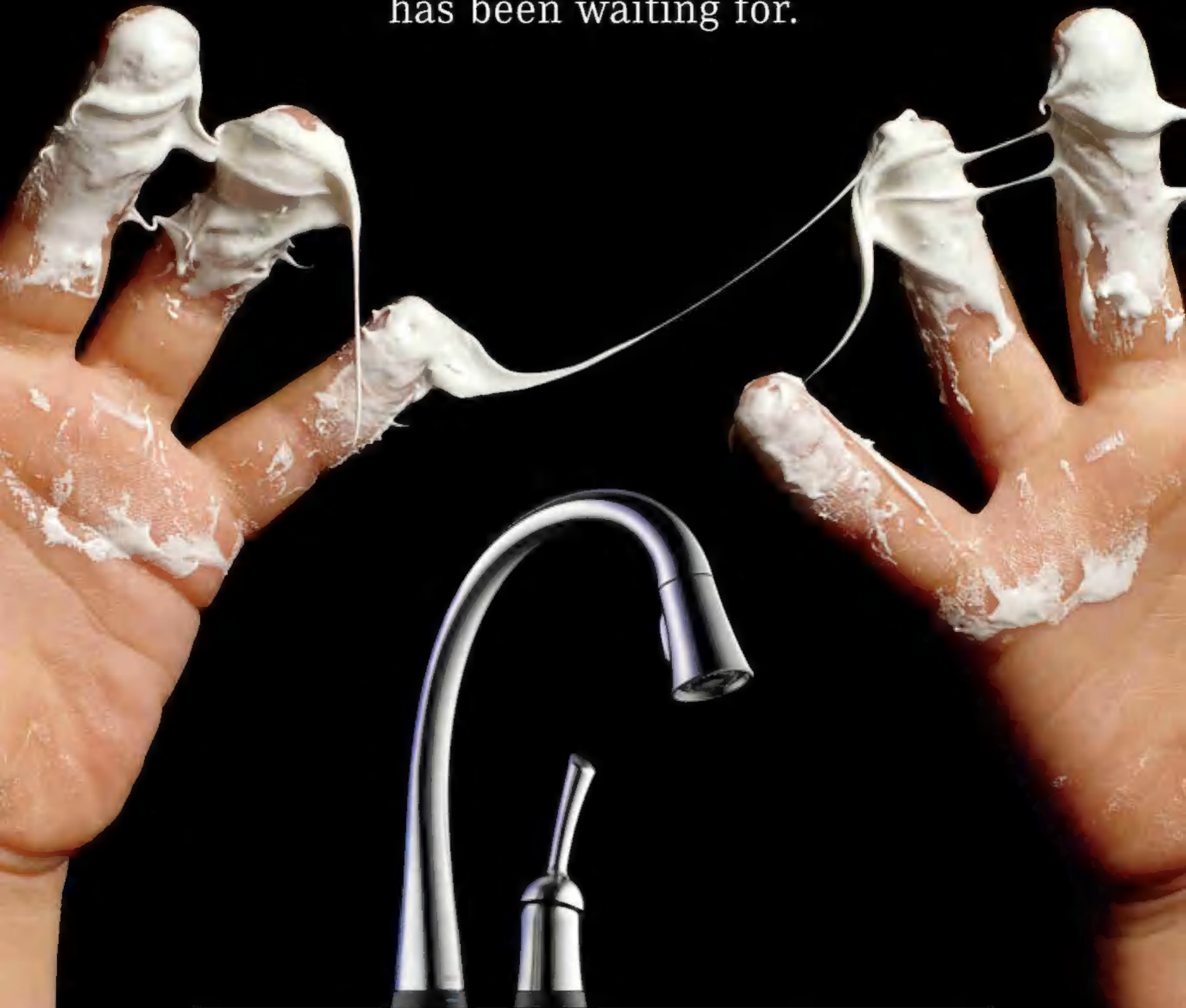
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3rd Generation
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Options shown. ¹The Solar Roof uses a fan to draw outside air into the cabin, lowering cabin temp. near outside ambient temp. Must be turned on prior to leaving vehicle, and parked in direct sunlight. See Owner's Manual. ²Avail. on Prius III and IV only. ³2010 EPA 51/48/50 city/hwy/combined mpg est. Actual mileage will vary. ©2009 Toyota Motor Sales, U.S.A., Inc.

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